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COMPRESSED AIR MAGAZINE

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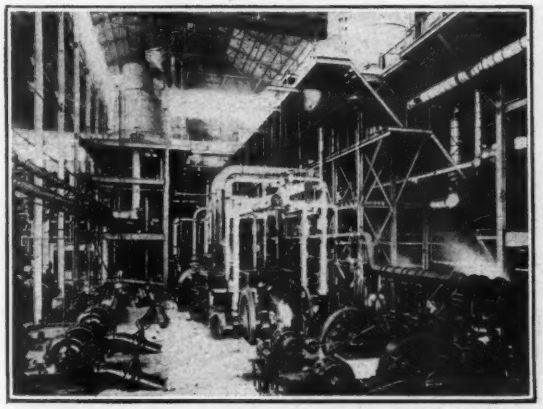
Compressed Air in Raw Sugar Factories

By FRANCIS JUDSON TIETSORT

THE AUGUST issue of COMPRESSED AIR MAGAZINE contained two very useful and interesting articles on the employments of air in the sugar industries, one by Mr. W. A. Becker, who described practice in both cane and beet factories, and the other by Mr. G. A. Meyer, whose observations concerned themselves with the air lift as employed in beet factories. These subjects are of growing interest to sugar house engineers and we are therefore glad of the opportunity to present further data which we have obtained through the courteous coöperation of the Honolulu Iron Works Company and the Krajewski-Pesant division of the United States and Cuban Allied Works Engineering Corporation.

We have likewise been enabled to procure from these companies the illustrations accompanying this article, which will give any unversed reader a comprehensive idea of modern installations of raw sugar production equipment, with the exception of minor details.

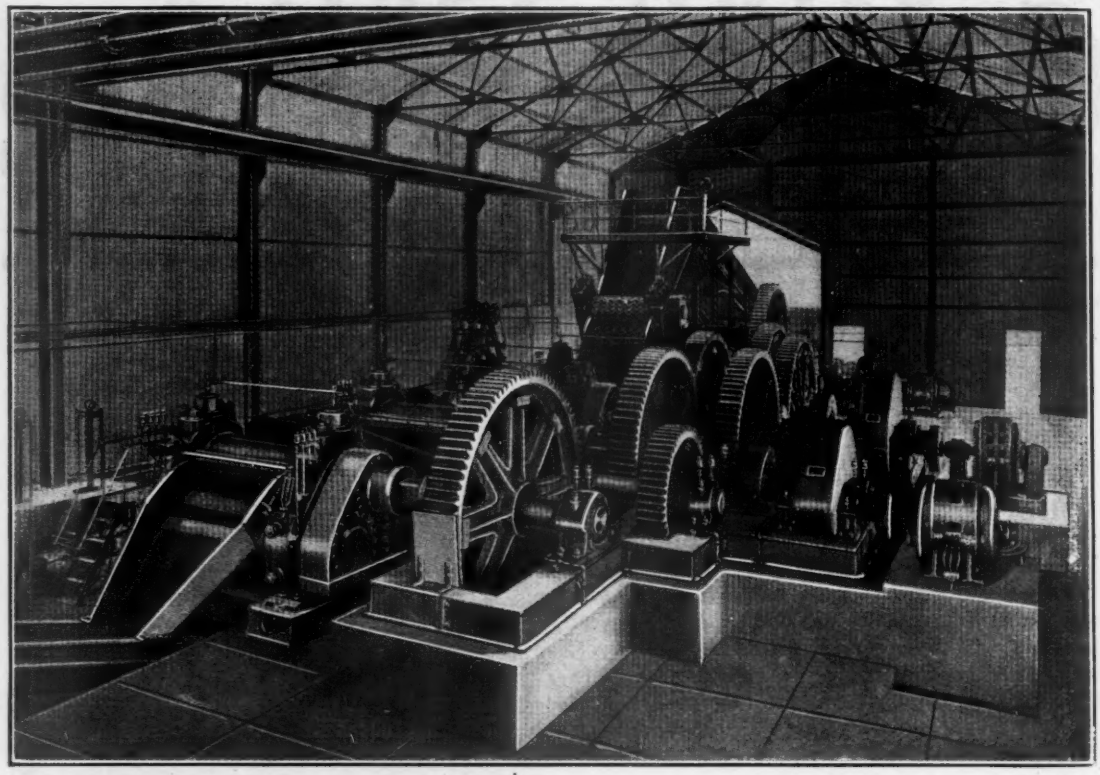
Even for a layman the newtime sugar central, when in operation during the "campaign," or grinding season, is a thing of fascination and consuming interest. From the spectacular standpoint raw sugar making has no rival among the picturesque industries of the tropics. Two years ago the writer completed a tour of visitations among some three-score West Indian centrals, inspecting among others, the famous Guanica Central at Ensenada, Puerto Rico, owned by the South Puerto Rico Sugar Company. The plant of this company, which directly and indirectly employs some 30,000 persons during the grinding season, is rated as the largest cane raw sugar factory in the world in point of capacity, but second in production, inasmuch as it grinds on the



INTERIOR VIEW OF A CANE SUGAR FACTORY, SHOWING TWO BELT-DRIVEN IMPERIAL TYPE XB INGERSOLL-RAND VACUUM PUMPS IN THE RIGHT FOREGROUND.

average during only six months of the year, as against nine months' grinding by its great Cuban rival.

With the shutting off of the production and sale of alcoholic beverages in the United States there has already been a noticeable increase in sugar consumption, for well known physiological reasons and the public as a whole has had an added interest in sugar, the dearth or absence of which was one of the material hardships for Europeans in the course of the war. The writer was instrumental in having moving pictures made of Guanica Central in operation, these pictures having proved of the greatest popular interest for large audiences in Carnegie Hall, New York, and in other metropolitan cities throughout the United States when displayed and explained by Mr. Newman of "Newman Traveltalks" fame. Moving pictures of sugar machinery in action



MILLING PLANT OF THE CENTRAL AMERICA IN CUBA, ELECTRICALLY DRIVEN AND SET IN CONCRETE FOUNDATIONS. THIS EQUIPMENT CONSISTS OF A 34″x78″ KRAJEWSKI CRUSHER DRIVEN BY A 150 H. P. ELECTRIC MOTOR; A 36″x78″ KRAJEWSKI NINE-ROLLER MILL, DRIVEN BY A 500 H. P. ELECTRIC MOTOR; AND A 36″x78″ KRAJEWSKI THREE-ROLLER MILL, DRIVEN BY A 250 H. P. ELECTRIC MOTOR.

taken in Cuba by the General Electric Company and displayed in theatres throughout the country also have proved of interest to hundreds of thousands of people who knew nothing, of course, about the technical side of sugar-making, but who were nevertheless enabled to obtain a very good insight into how cane was converted into sugar.

Guanica Central is a collossal enterprise. Five thousand tons of cane a day is ground when the milling plants are working at full capacity. Production is on a highly scientific basis, chemistry playing a large part. Every carload of cane that comes into the central over the company's railway lines from the thousands of acres of cane fields, is weighed, a note made of the car number and the field of its origin and the juice of the cane in that car is tested in the laboratory. If the tests show that the cane is not ripe enough, cutting in the field from which it came is stopped. If it lacks fertilizer, this failing is remedied in due course. The exhaustive story in the records of a crop indicate to what an extent science has taken the guessing out of sugar production.

Molasses that the sugar centrals formerly threw away has for a number of recent years brought a good price from the industrial alcohol makers. The burning of the *bagasse* saves on coal and oil consumption in the furnaces. Scores of economies have been effected in the modern plants and new methods have been introduced. The number of competent engineers engaged in designing new and improved apparatus is limited, but these men are constantly striving for simplicity and efficiency in sugar production. Their work, in effect, is to keep down the cost of this highly concentrated food for its hundreds of millions of consumers.

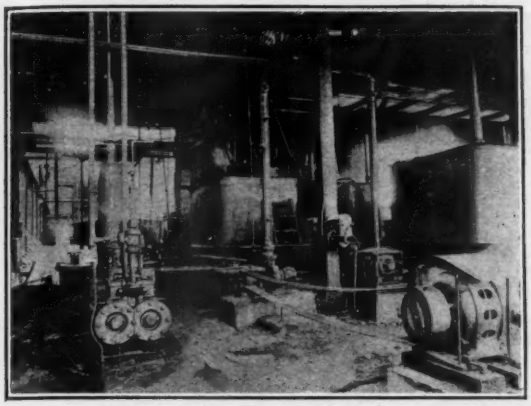
The use of compressed air in the raw sugar factories is of comparatively recent origin, and thus far it has not been employed to the extent to which it is susceptible.

The principal uses to which air is now directed in cane sugar factories, according to the engineers of the Honolulu Company, are the following:

a—To operate tools, tube expanders, tube cleaners, etc.

b—To agitate liquids under chemical treatment.

c—To elevate liquids and semi-liquids.



IN THIS VIEW A MOLASSES BLOW-UP TANK IS SHOWN IN THE CENTER BACKGROUND.

d—To accelerate the flow of heavy liquids when discharging from one closed vessel to another.

The operation of machine tools and cleaners is only required respectively, during erection, and when the factory is at a standstill, or during the week-end, or in the off-season, and the requirements are the same as in field construction work. Special mention might be made of air tube cleaners, however, which are particularly useful in a sugar factory for cleaning evaporator tubes.

The air drive is a very convenient one, and the ventilation and cooling of the cells is conducive to the comfort of the workman engaged.

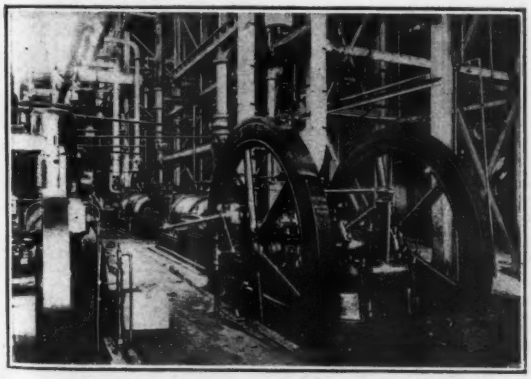
The agitation of liquids by compressed air is very widely used, and low pressures only are necessary to suit the depth of the liquid. The air is usually introduced to the open tanks by means of perforated coils.

The third field of service is a fairly old one, and was more in use when factories were built on the low plan. Modern factories are usually so arranged that the liquids gravitate where possible, particularly when referring to the thick *massecuites* which are now invariably arranged to flow from one vessel to another.

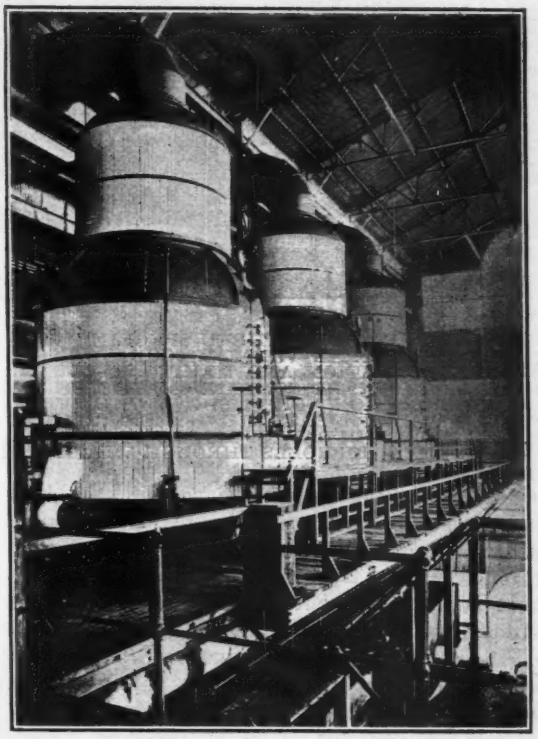
Particular instances may still necessitate the use of compressed air for elevating liquids, however, and the usual pressure necessary is from 30 to 50 lbs. per sq. in. The volume of air and its pressure will depend on the size of the vessels and other governing local conditions.

The fourth use mentioned above is a more recent innovation and growing in favor in large factories for assisting the flow of the thick *massecuites* from the vacuum pans to the crystallization tanks.

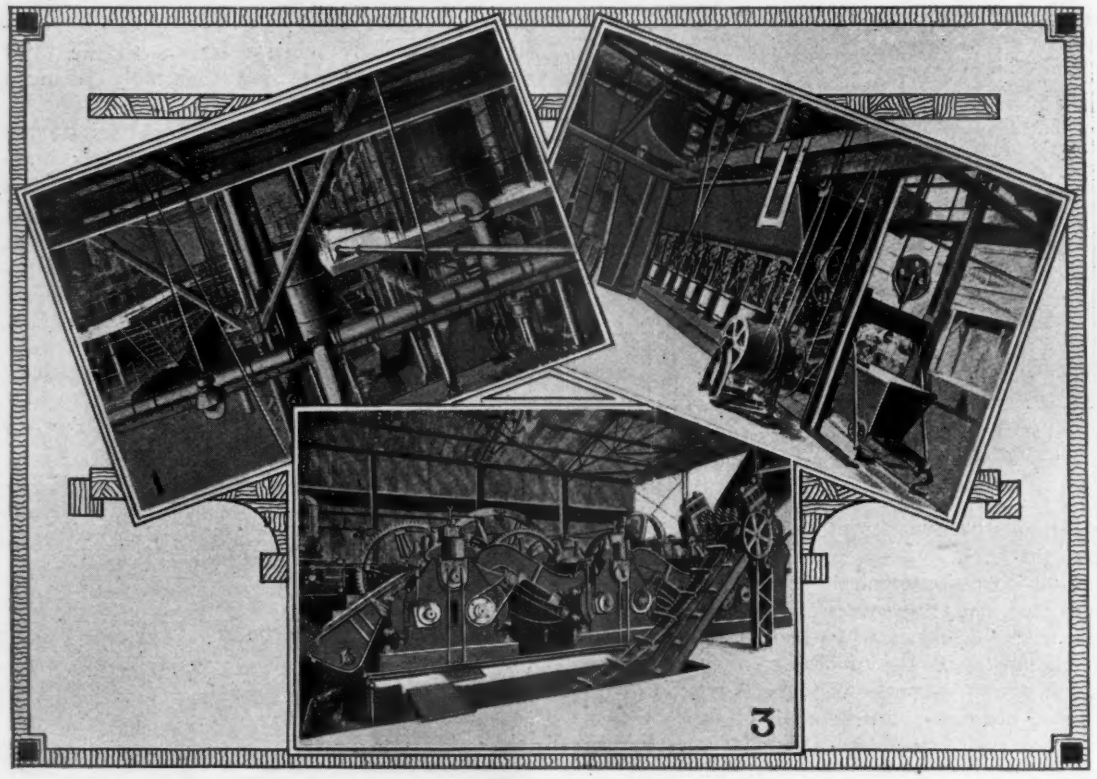
The *massecuite* when discharged from the pan consists of a thick magma of sugar crystals and molasses, and is commonly conveyed by means of open gutters. Closed pipes are now preferred, however, as this enables air pressure to be put into the pan to assist the flow of viscous liquids and reduces the time necessary to empty the apparatus. The usual pressure used is from 10 to



SINGLE, FLYWHEEL, VACUUM PUMP, DIMENSIONS 29½x39⅜"x39⅜" USED IN A SUGAR HOUSE.



THIS PHOTOGRAPH DEPICTS A HONOLULU IRON WORKS INSTALLATION OF THREE THIRTEEN-FOOT CALANDRIA PANS. THESE PANS ARE SOMETIMES ARRANGED SO THAT THEIR CONENTS MAY BE EMPTIED BY MEANS OF COMPRESSED AIR.

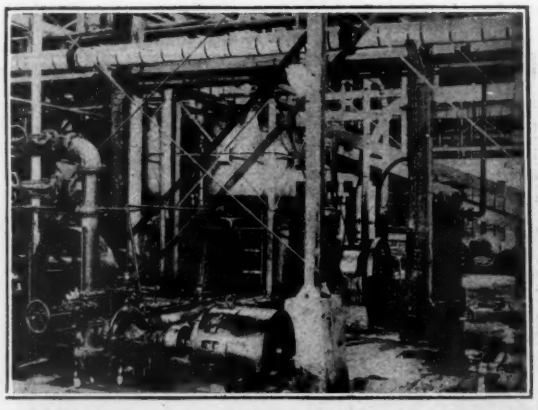


HERE ARE SHOWN THREE SPECIMEN VIEWS OF A COMPLETE SUGAR FACTORY INSTALLATION FOR CENTRAL VANNINA, CUBA, WHICH WAS DESIGNED, BUILT, ERECTED AND HANDED OVER IN OPERATION AND MAKING RAW CANE SUGAR BY THE KRAJEWSKI-PESANT CORPORATION, A COMPONENT COMPANY OF THE UNITED STATES AND CUBAN ALLIED WORKS ENGINEERING CORPORATION. FIG. 1 SHOWS THE SERIES OF VACUUM PANS AND EVAPORATION SECTION. FIG. 2 DEPICTS A BATTERY OF CENTRIFUGAL MACHINES IN WHICH THE MOLASSES IS SEPARATED FROM THE RAW SUGAR CRYSTALS. FIG. 3 SHOWS A FORMER TYPE OF KRAJEWSKI CRUSHER AND THE MILL ROLLS THROUGH WHICH THE CANE PASSES.

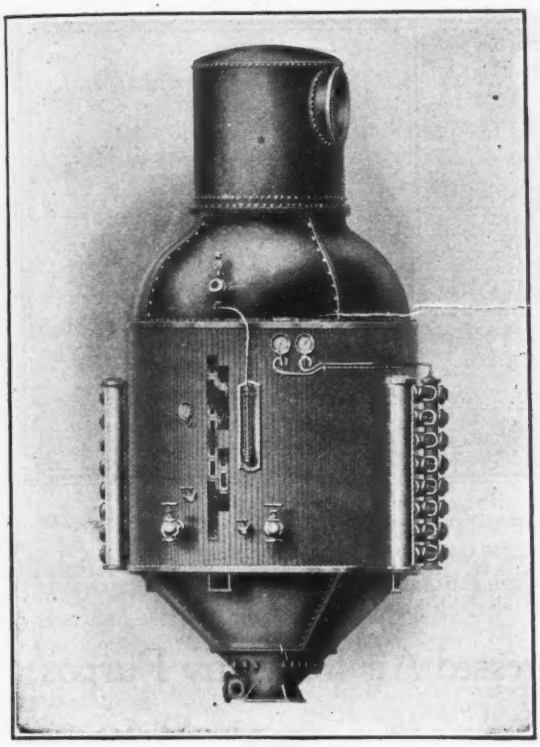
15 lb. per sq. in., whilst the volume should be based on the size of the vacuum pan and time required to empty. The *massecuite* is discharged through pipes varying usually from 8″ to 14″ bore and steaming-out connections are fitted at suitable points for cleaning out.

At the new Central Romana, La Romana, San Domingo, compressed air was used in the erection of the buildings and structural work, and the compressors operated at 75 lb. pressure. They are used for this and similar purposes during the off-season. At this modern plant there are two 10″x12″ duplex Ingersoll-Rand machines having 415 cu. ft. displacement per minute, at 210 r.p.m., driven by short belt drives from 75 h.p. motor running at 900 r.p.m. One of these is used as a spare. The short belt drive feature in a sugar factory is a consideration, because space is at a premium.

During the grinding season when emptying the vacuum pans, they operate at 10 to 15 lb. pressure and a suitable receiver is provided to give regulation. Usually a pressure of 8 lb. is found sufficient for this purpose and the results obtained from this arrangement have been good.



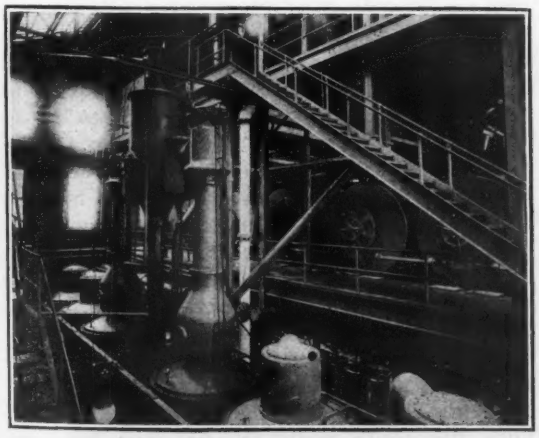
AIR COMPRESSOR AND RECEIVER INSTALLATION IN A CUBAN SUGAR MILL. THE RECEIVER IS AGAINST THE COLUMN ON THE RIGHT.



A MODERN VACUUM PAN MANUFACTURED BY THE UNITED STATES AND CUBAN ALLIED WORKS ENGINEERING CORPORATION OF NEW YORK AND HAVANA.

tremely satisfactory, making for neatness and cleanliness, besides saving considerable labor in the manipulation of troughs and increasing the operating time of the pans.

The illustrations will afford the reader an idea of the complicated and expensive machinery and apparatus that is required for the equipment of the modern cane factory. Plants for which the machinery installation costs several million dollars are by no means uncommon in these days of scientifically efficient production. Large concerns like the Krajewski-Pesant division of the United States and Cuban Allied Works Engineering Corporation, the Honolulu Iron Works Company and the Fulton Iron Works, in these days not infrequently make contracts for the building and erection of entire cane sugar plants, which are turned over in working order with a guaranteed production and housed in steel and concrete structures.



AN INSTALLATION OF CLOSED CRYSTALLIZERS. CONTENTS OF THESE ARE OFTEN EMPTIED BY MEANS OF COMPRESSED AIR.

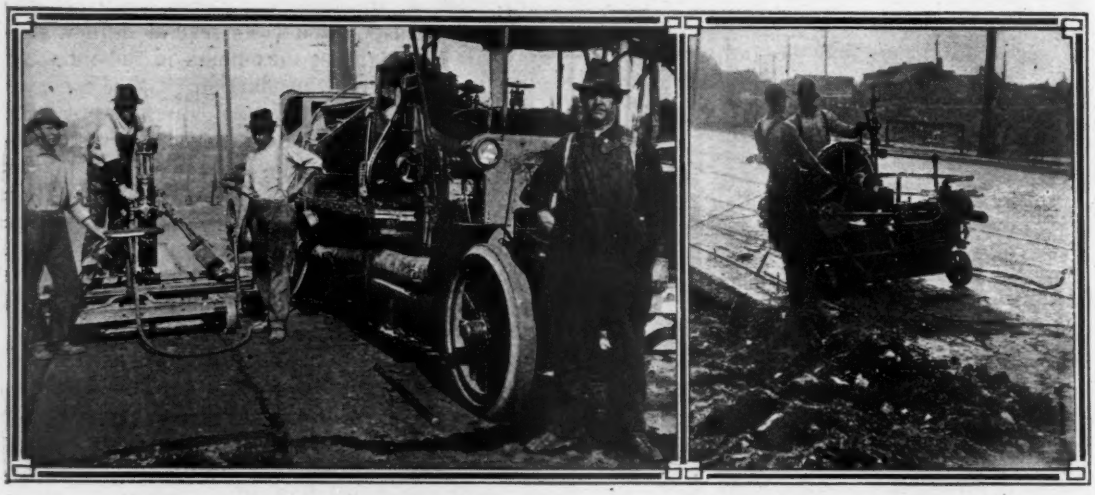
Good sugar production men are in demand and receive high salaries. Companies such as that owning Guanica Central in Puerto Rico provide for their principal employes and their families all of the comforts and conveniences it is possible to introduce into tropical or semi-tropical countries. Modern homes with wide spreading, shady porches, lawns and flowers, club-houses, churches, moving pictures, outdoor sports and other diversions are provided. On the beautiful bay in which American troops first landed in Puerto Rico in the Spanish-American War, boating and good fishing are available, and the splendid stone boulevards of Puerto Rico, numbering some 1,200 miles of thoroughfares from which magnificent mountain and marine scenery may be viewed, are a paradise for the motorist.

Life in that particular sugar-growing country, at least, has its attractions and compensations.

Captain C. A. Duntley, who recently received his honorable discharge from the army after serving as captain in the 27th Field Artillery, has been elected vice-president of the Duntley-Dayton Company, with headquarters in the Westminster building, Chicago. He was born in Chicago on October 21, 1892, and received his education in the Armour Institute, Chicago, and Cornell University, from which latter school he graduated in 1914. Captain Duntley will have charge of the sales work of the pneumatic and electric tool department of the company, which consists of a complete line of portable electric drills and grinders, as well as a full line of accessories, such as hose and hose couplings, rivet sets and chisel blanks.

* * * *

Donald C. Barnes, Everett, Wash., manager of the traction and power properties of that city, has been appointed manager of the Seattle Division of the Puget Sound Traction, Light & Power Company, to succeed A. L. Kempster. He has moved from Everett to Seattle to make his headquarters in the Electric Building at Seventh avenue and Olive street.



Photos Compressed Air Magazine Illustration Service.

THE VIEW AT THE LEFT SHOWS A LOS ANGELES CITY DEPARTMENT MOTOR TRUCK THAT CARRIES AN AIR COMPRESSOR, TOGETHER WITH AIR DRILL USED FOR CUTTING THROUGH ASPHALT AND CONCRETE. IN THE PICTURE AT THE RIGHT IS TO BE SEEN A HOIST OPERATED BY COMPRESSED AIR AND USED FOR FILLING IN EXCAVATIONS.

City of Los Angeles Uses Compressed Air for Many Purposes

By CHARLES W. GEIGER.

THE LOS ANGELES water department has equipped two motor trucks with air compressors which are used extensively in maintenance work. The compressors are operated by the 40-h.p. motor that operates the truck, special transmission gear having been designed for this purpose. The radiator and fan from an old auto has been mounted on the compressor for keeping the same cool. The fan is operated by a belt running from the flywheel of the compressor.

The compressor has been equipped with a speedometer, taken from an old auto. The air tank is mounted on the rear of the truck. Compressed air is used for cutting and calking cast iron pipe and also for riveting and calking sheet steel pipe. It is also used for operating an air drill which has been designed by the superintendent of the water department for cutting through asphalt and concrete pavement, when excavations are to be made for laying new pipe or repairing old pipe. Compressed air is also used for operating a portable hoist in filling in excavations.

In cutting through asphalt and concrete, an old air drill that was used in the construction of the Los Angeles Aqueduct has been remodeled and mounted on a carriage which in turn is mounted on a truck. The truck can be easily and quickly taken apart and carried on the motor truck for transporting from place to place.

The truck which carries the air drill works along the side of the motor truck that carries the air compressor. An air hose connects the air drill with the air tank. The truck carrying the air drill is moved forward by means of a ratchet working on one wheel of the truck. The entire device straddles the strip of pavement that is to be cut through. A path four feet in width can be cut at one operation.

Three men are required to operate the drill and in moving the truck forward. A fourth man operates the compressor. One man operates the air drill, a second operating the ratchet moves the truck forward as the cutting progresses, and a third operating a wheel and ratchet, moves the air drill back and forth across the strip to be cut.

A sharp wedge is used in cutting through the asphalt. After a strip of asphalt has been cut through it is removed and loaded on to a motor truck. For breaking up the concrete a square bit somewhat heavy on the end is used. This bit is directed against the surface of the concrete while the air drill is operating, until the concrete is broken through for about an inch below the surface. The bit is then moved sideways about 6 inches and the pounding is directed at one point until this is broken through. This is continued until the entire width of the strip has been pounded, when the entire apparatus is moved for-

ward about 8 inches, and the same operation is repeated. This pounding breaks up the concrete so that it can readily be shoveled from the trench into a motor truck. A space 4 feet in width and 120 feet in length can be broken up in one day.

The hoist used in filling in excavations is an old steam hoist that was used in the construction of the Los Angeles Aqueduct. This hoist travels along the excavation as seen in the accompanying photograph. The drum and cable drag a scraper which is used in filling in the excavations.

For operating the air hoist, a pipe connected to the air tank on the motor truck (which is parked along the trench) extends along the trench, with hose connections at convenient points. An air hose connects the hoist with this pipe. It requires three men to operate this equipment, two for the hoist, and a third man on the scraper. For moving the hoist forward, a rope attached to the truck that carries the hoist, extends forward to the truck carrying the air compressor. This rope passes through a pulley and is returned to the hoist. By wrapping this rope around the niggerhead and starting up the drum, the hoist is carried forward the required distance.

As shown in the photograph the trench was filled in by this means without interfering with street car traffic.

One of the motor trucks also carries a centrifugal pump, and compressed air is used in priming this pump. For this purpose a small air pump is mounted on the centrifugal pump and connected with the air tank. In order to start the suction, both the water pump and the small air pump are started up, then the main valve of the water pump is opened and the air pump closed.

VACUUM STREET CLEANER AT LOS ANGELES

Flushing of paved streets has been practically eliminated at Los Angeles, Cal., by the use of vacuum cleaners instead. The City Engineer, A. C. Hansen, gives the following particulars in his last annual report:

During the year ending June 30, 1918, four vacuum cleaning machines were employed, working two shifts of 8 hours each under the supervision of two city inspectors. The city paid 10½ ct. per 1,000 sq. yd. cleaned, the contractor furnishing and maintaining the equipment with a driver. The four machines clean approximately 1,500,000 sq. yd. of pavement each day of two shifts. These machines have a vacuum suction apparatus, with a rotary fan operated by an independent motor mounted on a 2½-3½-ton truck. Each machine is equipped with a speed recordograf that registers the speed traveled during any portion of the day, the distance traveled, and the time during which no work is being done, whether standing in the garage or on the shift. As the speed at which these machines are operated is an important factor in the quality of work produced, the contract is conditioned for a speed not to exceed 4½ miles per hour, and as the recordografs register the miles traveled during each shift they operate (within certain limits) as a check upon the speed maintained while cleaning a street, and on the area claimed to have been swept.

MINING IN NEW YORK CITY

By LINWOOD H. GEYER

NEW YORK CITY is perhaps one of the biggest mining camps in the country when thought of in terms of rock drilling, blasting and rock removal. The work ranges from the sinking of shafts, driving of tunnels, cut and cover subways and foundation sinking to cliff removal and road work. A notable illustration is the elimination of the present grade crossing at 161st Street and the Concourse, now being done by the Fred Schneider Company, Inc. To prevent de-

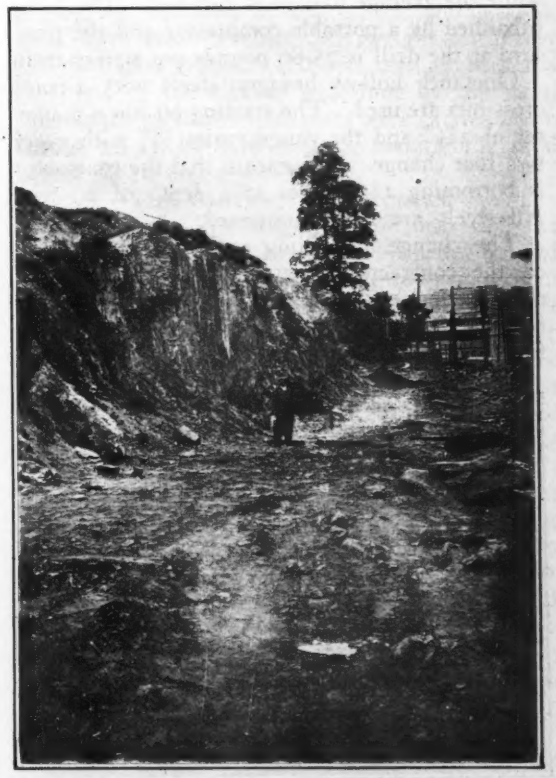


FIG. 1—ROCK CUT AT TRANSVERSE ROAD CROSSING, 161ST AND CONCOURSE.

lays of the rapidly increasing traffic on the Concourse and avoid danger, the crosstown street is being lowered. This project, involving the removal of a large yardage of hard rock, and the drilling of New York altered gneiss offers another example of the possibilities of the hand hammer drill. The desired result and the method of highway and bridge construction are similar to the completed work at the Kingsbridge Road transverse crossing.

The average cut is 20 feet with a maximum of 35 feet. (Fig. 1). Up until the present time down hole drilling has constituted the greater portion of the work. However, due to the results of blasting, it has been found necessary to drill a number of lift holes in front of the steam shovel.

At first, tripod piston air drills were employed, on the assumption that they were necessary to deep-hole drilling. An average footage of 70 feet per 8 hour day was realized. The contractor, however, selected three Ingersoll-Rand type DDR-13 Jackhamer Sinkers, and, after a test, discarded the piston drills. Since their installation the Jackhamer Sinkers have been drilling to an average depth of 20 feet. The maximum total per drill per 8 hour day has been 151 feet while the average footage is 120 feet. The air is furnished by a portable compressor and the pressure at the drill is 75-80 pounds per square inch.

One inch hollow hexagon steels with 4-point cross bits are used. The starting bit has a diameter of 2⅝" and the gauge varies ⅛" with every two foot change. This means that the contractor is bottoming 1½" holes at a depth of 20 feet. All steels are hand sharpened.

The change in drilling equipment has afforded the contractor a saving in both time and money which will pay for the installation many times over. Two men were formerly required for each piston drill and considerable time was lost in moving the drill and in changing steels. Not only does the Jackhamer Sinker drill nearly twice as much but it requires but one man to operate and move the Jackhamer Sinker. The elimination of dead moving time by not having to shift the heavy tripod mountings in itself constitues a considerable saving. The Jackhamer Sinker is readily portable and has no chuck or saddle bolts.

FIG. 2—EIGHTY-FIVE TON RAILROAD SHOVEL REMOVING ROCK AT 161ST ST. AND CONCOURSE.

FIG. 3—D D R-13 INGERSOLL-RAND JACKHAMER SINKERS AT WORK AT 161ST ST. AND CONCOURSE.

This saving can best be realized in the comparison of the old with the new steam shovel equipment. With the piston drills a 25-ton shovel was ample, but since Jackhamer Sinkers have been used the contractor has found it necessary to install an 85-ton railroad shovel (Fig. 2) to keep up with the removal of the rock.

Horacio V. Garza has been appointed assistant purchasing agent of the National Railways of Mexico, with headquarters at New York City, succeeding F. P. de Hoyos, local purchasing agent.

A Peculiar Pneumatic Cassion Problem

THE WESTPORT station, near Baltimore, of the Consolidated Gas, Electric Light and Power Company is located about 200 ft. from the Patapsco River and the space between the power house and the river is used for the storage of coal brought up the river in barges and unloaded by a tower hoist. It was determined last year to add a second hoisting tower and a bridge. It was to be expected that in the building of the foundations for this tower there would be special difficulties encountered, because the weight of the coal stored between the power house and the water front had started a movement of the ground toward the river sufficient to throw the discharge tunnels badly out of line. The Foundation Company of New York was engaged to design and construct the necessary piers, and for the description of operations, here presented in condensed form, and for the accompanying illustrations we are indebted to *Engineering News Record.*

Borings had shown that, under about 50 ft. of soft material, there was a stratum of compact sand. It was evidently necessary to sink the

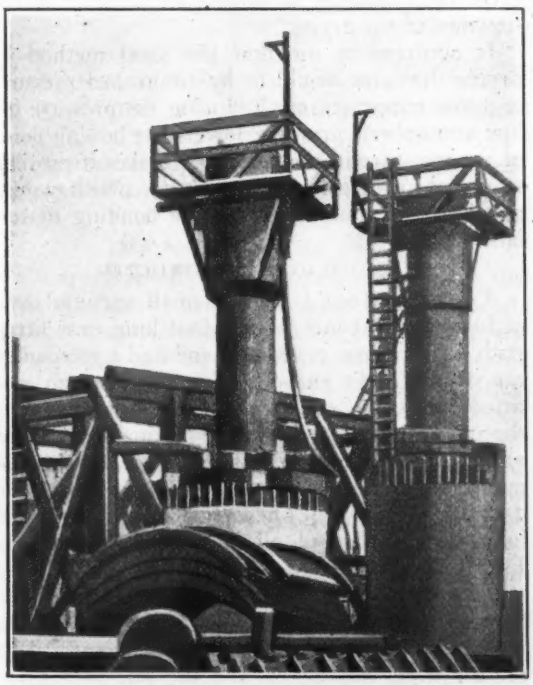


FIG. 1—CAISSONS SUNK THROUGH SHIFTING GROUND.

foundation piers far enough into this hard stratum to permit them to withstand the flow of the soft material above.

The design finally adopted consisted of four cylindrical piers, 10 ft. in diameter, centered at the corners of a 24x25-ft. rectangle. These piers

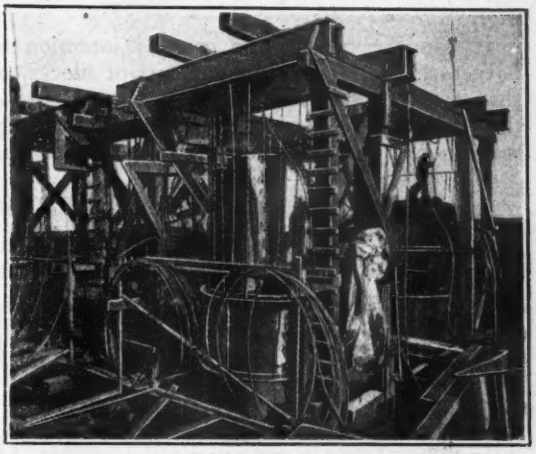


FIG. 2—FOUR PAIRS OF WIRE CABLES SUPPORT EACH CAISSON.

were built with concrete walls, 18 in. thick, re-inforced as indicated in one of the photographs, and were sunk by their own weight until they reached solid ground. Air was then applied, and the rest of the sinking was done by the usual pneumatic method. The piers were carried down about 20 ft. to hard bottom, making the total depth 68 ft. below water level.

THE CONTRACTOR'S PROBLEM

During the first stages of the operation the contractor was faced by the problem not only of keeping the caissons from sinking too rapidly, but also of holding them in alignment until they were solidly grounded. Four lines of piles were driven at right angles to the river; that is, parallel to the direction of movement of the ground. These piles were capped with 12x12-in. timbers and pairs of 24-in. 80-lb. I-beams laid across from one line to the next over each of the four caissons.

Each caisson was suspended from these I-beams by four pairs of wire cables attached to the cutting edge and extending up through the walls as they were concreted. Each cable passed up between the pair of I-beams, made a half turn over an oak block, and was fastened to itself with three ordinary clips. One cable in each pair actually supported the load while the companion cable was held in reserve for safety.

PURPOSELY OUT OF PLUMB

In order that the cutting edge might be in correct position when it reached solid bottom, it was necessary to counteract the movement of the

soil, by sinking the caisson out of plumb. The caisson was kept at this angle by adjustment of the supporting cables. When it was necessary to throw the caissons further out of plumb, the cables on the river side were slacked off, throwing most of the load to the cables on the powerhouse side and causing the caisson to tilt accordingly.

It was the contractor's original intention to have each cable pass through pairs of blocks, so that it could be more easily adjusted, but as these blocks were delayed in transit, the lowering was done merely by loosening the clamps and

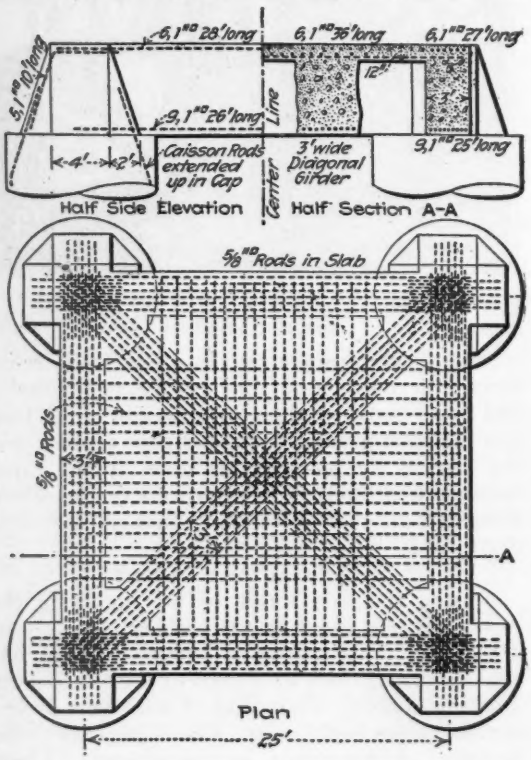


FIG. 3—REINFORCED CONCRETE CAP FOR PIERS.

allowing the cable to slip by itself. The safety cable in each pair was slacked off first the proper amount, and the clamps were tightened so that the motion of the caisson would be stopped at the proper point when the supporting cables were loosened.

After the caisson had been sunk 20 or 30 ft. it was necessary to shore against the side of the power house to hold it in the proper inclined position. When the cutting edge had been grounded securely, however, these shores were removed and the caisson was allowed to right itself.

After all four piers have been completed, they will be tied together at the top by deep concrete girders, which will stiffen them against the movement of the ground. Details of this cap and its reinforcement are shown in the diagram. The caissons are to be filled with a concrete core about 12 ft. thick at the bottom, with sand filling above it.

A. S. Loizeaux, electrical engineer, is in charge of construction for the Consolidated Gas, Electric Light & Power Co., and E. D. Edmonston is general superintendent of the Westport plant. The job was handled by C. B. Kowenhoven, superintendent, and William J. O'Neill, general foreman, under the direction of W. B. Taylor, district manager of the Foundation Company.

VACUUM OVENS FOR DRYING CORES*

IN THE USE of ovens for core drying the results desired are, the removal of the moisture and the oxidation of the bond. To attain the first the second is often more or less defeated. A great many core ovens are heated to a temperature which is destructive to the binding material. This makes a weaker core or necessitates the use of more bonding material. In the ordinary core oven, operated at atmospheric pressure, great oven capacity is needed on account of the slowness of the drying.

It occurred to me that the ideal method of drying the cores would be by diminished pressure at a low temperature. Reducing the pressure below atmospheric pressure, lowers the boiling point of the moisture in the cores and makes it possible to dry them at a low temperature, which would give the maximum effect of the bonding materials.

VACUUM OVEN CONSTRUCTED

To test this out I made a small vacuum oven as follows: A 3-inch pipe, 1 foot long, was fitted with a permanent cap at one end and a removable cap at the other end. The removable cap was fitted with two stopcocks and two hobs for a thermometer and a mercury vacuum tube. One of the stop cocks was connected to an exhaust pump and the other to a hot air oven, heated to 250 degrees Fahr. The cylinder was immersed in a tank of linseed oil heated to 250 degrees Fahr.

Two cores were baked at a time in this oven by placing them on a rack in the pipe and screwing on the top cap. The stopcock connected to the air oven was closed and the one to the exhaust pump was opened. When the air in the oven was exhausted to the limit of the pump (18 inches of mercury), the valve to the hot air oven was opened until atmospheric pressure was

*Abstract from G. W. Merrefield in *Foundry*.

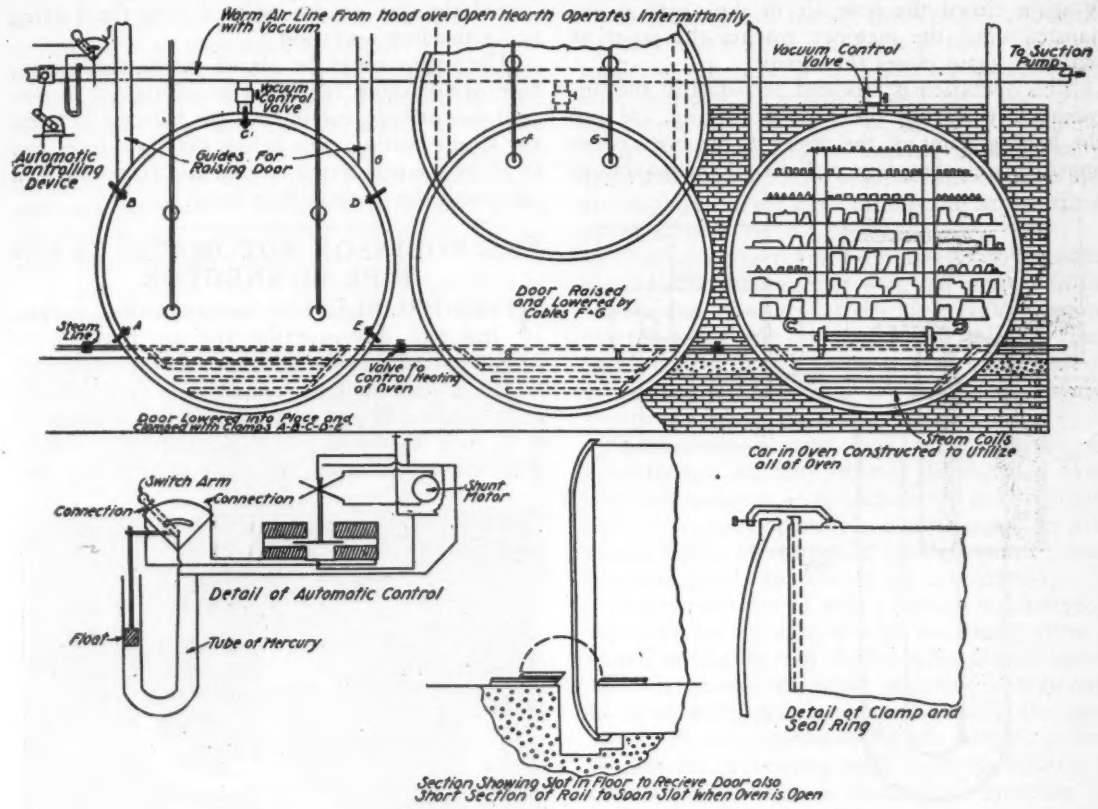


FIG. 1—PROPOSED ARRANGEMENTS OF THREE VACUUM CORE OVENS.

restored in the cylinder, and then again closed. This procedure was repeated until the cores were dried.

TIME SAVED IN THE DRYING

Comparative drying tests on small cores of the same size, made from the same batch of sand, showed that the vacuum drying at 250 degrees Fahr., with 18 inches of vacuum, was complete in from 15 to 25 minutes, while cores dried in a gas oven at 350 degrees Fahr. took 45 minutes to completely dry them. This was ascertained by weighing the cores until a constant weight was reached. The only difference in the drying is that the gas-oven-dried cores had the bond more completely oxidized than the vacuum-dried cores. But as this oxidization need not necessarily take place in the oven, the time saved in vacuum drying is apparent.

PROPOSED VACUUM OVENS

Fig. 1 is a sketch of a proposed battery of three vacuum drying core ovens. They are supposed to be made of boiler steel, air-tight and of sufficient size for the purpose. The cylindrical form will withstand the atmospheric pressure without buckling, when under a high vacuum. They are to be heated by live steam which will be able to impart a temperature of 250 to 275 degrees Fahr. in the ovens. Each oven is to be connected to the main exhaust line at the back and top and can be shut-off from connection with the system, when being loaded or unloaded, by turning the connecting valves.

An exhaust pump will be connected to one end of the exhaust line and on the other end will be a rotary valve operated by a shunt motor, which will automatically open the valve when the mercury in the tube reaches a predetermined height of vacuum, by closing the circuit, operating by either the lever or floating tube control shown in Fig. 2. As soon as this valve opens, it will allow dry warm air (supplied from metal melting furnace) to be drawn into the ovens, to replace the moisture laden air drawn out by the vacuum. When the vacuum is released by the inrush of warm air, the mercury drops in the tube to atmospheric level and closes the reverse circuit by the other contact, reversing the motor which again closes the warm air valve. While this operation is taking place, the exhaust pump is continually pumping, so that as soon as the valve

is again closed the new air in the ovens is exhausted until the mercury reaches the point at which it again closes the circuit.

This operation is repeated periodically and automatically during the time of drying, causing the boiling point of the water to be lowered to approximately 115 degrees Fahr., if the maximum

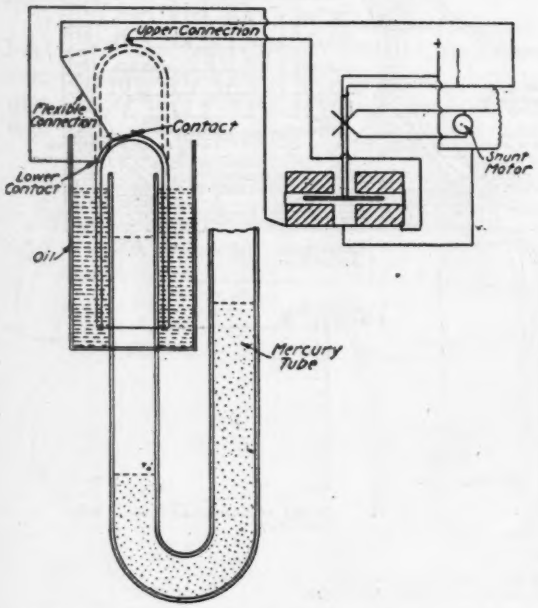


FIG. 2—DETAIL OF AUTOMATIC CONTROL.

vacuum is brought to 26 inches of mercury. This is readily obtained in commercial drying of food, etc., by vacuum. The vapors are actually drawn out of the cores, regardless of their size, in the effort to restore equilibrium while the vacuum is increasing. When the valve is opened and warm, dry air is allowed to rush in, the vacuum spaces within the cores are filled with this air, and again is drawn out laden with the moisture vapors when the next vacuum period occurs.

One can see that the complete removal of the moisture would soon take place under these alternate conditions and would take place regardless of the size of the cores or whether they were closely-packed in the oven. In fact, the closer the oven was filled the less time it would take per unit of cores, as there would be less air space to be pumped out each turn of the vacuum.

The doors could be made of cast or pressed steel and hung on cables as shown. An air-tight joint could be made by a composition or asbestos packing ring in the outer run of the casing and the door clamped tight with the clamps illustrated. This could be quickly done after each loading. The doors would be swung up out of the way on the cables during the loading and unloading operation.

The ovens could be placed inside the present core ovens, using the latter as insulators to prevent loss of heat, cutting out the bottoms to bring the steam heating coils below the floor level and to allow the perforated bottom and tracks to coincide with the general floor level.

THE ROBINSON AUTOMATIC TRAIN PIPE CONNECTOR

THE PROBLEM of automatically connecting and disconnecting the air brake pipes when railroad cars are coupled or uncoupled would at first thought seem to be a very difficult and complicated one, but the practical solution of it as here shown is really astonishingly simple. The task is not really any more difficult for first

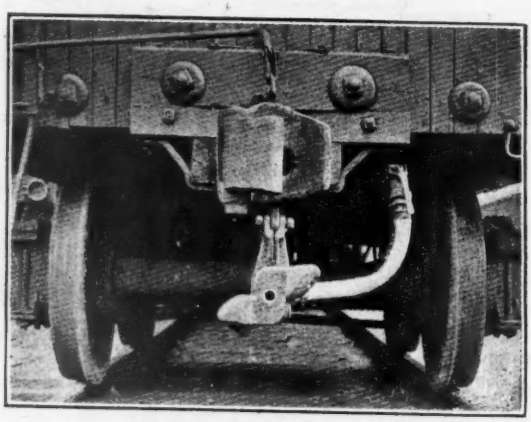
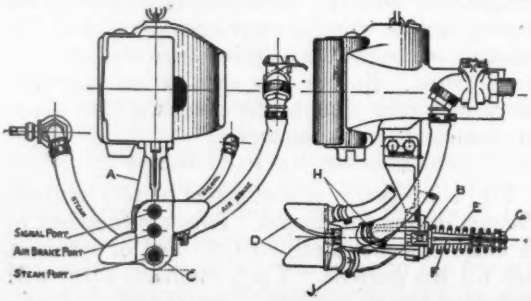


FIG. 1.

class passenger service where not only the air brake pipe but also the conductor's air signal and the steam pipe are also to be similarly connected.

Fig. 1 shows the automatic connector as installed upon an ordinary freight car equipped with standard train coupling. Below the train coupling and centrally located is seen the vertical flat face of the automatic air coupling with the



FIGS. 2 AND 3.

hole in the center for the air and two flaring projecting wings upon opposite corners. The connector is so suspended as to be free to move a sufficient distance both vertically and laterally to compensate for differences of precise location on different cars and for variations caused by differences in loading, curves, etc. The projections on the faces when they come together and mutually lap over the corners of each other bring the two faces to correspond and locate the air holes opposite each other.

The connector also is movable lengthwise of the car and each face to be coupled is pressed forward by a stiff helical spring, so that when two cars come together to be coupled the faces of the connectors are the first surfaces to come in contact and they are thrust back a certain distance, each opposing the other, and they are held pressed together constantly with sufficient force to make the pipe joints tight, suitable gaskets surrounding each opening.

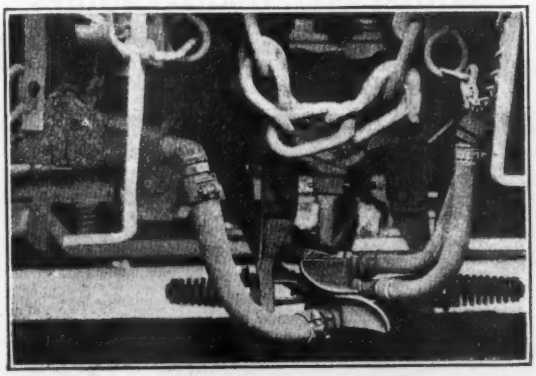


FIG. 4.

Figs. 2 and 3 give front and side views respectively of the coupling as installed for passenger service. The short sections of hose of course remain permanently coupled, and are not subject to wear or abuse. Fig. 4 shows the ends of two cars with all appurtenances as actually connected in service. The connector has been thoroughly tested in service and has the approval of the Interstate Commerce Commission. The address of the Robinson Connector Company is 17 Battery Place, New York City.

USES OF MERCURY*

The use of mercury for thermometers consumes, according to F. L. Ransmore, only a small fraction of the total quantity produced. Mercury is a constituent of many drugs and chemicals, including calomel and corrosive sublimate, and mercuric oxide and mercury salts are used in the manufacture of certain chemicals of which the mercury itself does not form a part. For example, in one process of producing glacial acetic acid, acetylene is oxidized with mercuric oxide, the same lot of mercury being used repeatedly. Mercury is used also in making phthalic anhydride and phthalic acid, organic compounds which are employed in the dye industry but which themselves contain no mercury.

The use of mercury fulminate as a detonator has expanded enormously with the increase in the variety and efficiency of the high explosives now manufactured for industrial and military purposes, and, although primers have been made of other materials, especially for small arms, no substitute has found general acceptance.

Quicksilver is now used extensively in the manufacture of anti-fouling ship-bottom paint. The consumption of quicksilver in gold-dredging and other placer operations is still large. In gold-quartz mills, however, the amalgamation process has been partly supplanted by cyanidation.

Among the varied uses to which quicksilver is put may be mentioned also its employment in dental amalgams; in the manufacture of laboratory air pumps and other scientific instruments; in thermostats, gas governors, and similar appliances; in mercury-vapor electric lamps; in compounds for preventing scale in steam boilers; in cosmetics; in certain electrolytic processes for the manufacture of chlorine, caustic soda, and picric acid; in primary batteries, electrolyzers, rectifiers, and other electrical equipment; and in felt making.

*From Bulletin 666-FF. U. S. Geological Survey.

THE CEMENT GUN ON THE RAND

The Cement-Gun is at present in use at the Modder East, Ltd., for making brattices underground. These brattices were formerly made of bricks, but we understand from the mining people that the "Gunite" brattice is a much more satisfactory job in every way, and does not cost 50 per cent. of the brick brattice. We are informed that Springs Mines have ordered two Cement-Guns for similar work. The machine is extensively used for making panels for walls and roofs in buildings, and also for the protection of iron and steel from corrosion.

Clement K. Quinn and associates, of Duluth, have purchased from the Jones & Laughlin interests the Rolling Mill mine, at Negaunee Mich. The Rolling Mill shipped 250,000 tons during 1916 and has a capacity of 300,000 tons. It was idle during 1917 and 1918.

Survey of the Technical Field

Edited by FRANK RICHARDS

EXPLODED GAS CYLINDERS INVESTIGATED

An elaborate report of a very complete investigation into the causes of fracture of two compressed gas cylinders—one for hydrogen and the other for oxygen—which burst while being filled, is given in *Zeitschrift des Vereines deutscher Ingenieure,* March, 1919.

The hydrogen cylinder was being filled with the gas at a pressure of 140 atmos. The explosion was extremely violent; the floor on which the cylinder was standing was found to have a hole in it 75 cm. deep; the flask or cylinder flew upward like a projectile, passed through the roof of the filling room, and fell in a garden some 85 m. distant.

An examination of the plant (compressor and fittings) revealed it to be in order. The gas was produced electrolytically and collected in a gasholder, after which it passed into a two-stage compressor and was compressed to a filling pressure of 150 atmos.

A full chemical, mechanical and micrographic examination was made of the fractured cylinder, from which the writer concludes that it satisfied the requirements of the authorities. Probably a "fold" or crease formed in the steel while being mechanically treated, and this creasing gave rise to a crack or cracks, which were most likely the cause of the explosion. He suggests that in addition to the prescribed precautions relating to the inspection of these vessels, each seamless vessel should be "flash-tested" (this test is not defined) before the head is put on, in order to find faulty places. This method has been adopted by the military authorities prior to the acceptance of all shells. This test would enable any creases to be discovered in the steel.

In the case of the oxygen cylinder a greater number of splinters were available. The cylinder is said to have burst during the process of filling at a pressure of 80 to 100 atmos. The oxygen used was obtained from liquid air. The cylinder was of similar construction to the hydrogen cylinder, being of the seamless-steel type. The same official regulations applied in this case also. The article describes in detail the mechanical, chemical, etc., tests carried out on the fragments collected.

Numerous causes contributed to the bursting of the cylinder as shown by the experimental results. The steel was weakened at one particular part where the test initials were stamped, as the stamp penetrated to half the wall thickness of the cylinder. The steel was too brittle for the purpose in question. It was very sensitive to dynamic stresses. The author suggests that the regulation regarding the stamping of these cylinders should be modified. The stamping should be reduced to a minimum, and be done when the steel is in a red-hot state. A mere pressure test is, when employed alone, very defective. It is much more important to test the inside and outside surfaces and the thickness of wall of each cylinder prior to putting on the top.

SANDBLASTING AUTO BODIES

The photograph depicts the sandblasting of the metal body of a sedan with a stream of sand,

Photo copyright, Keystone Photo News Co., N. Y.

driven through the hose under air pressure. to cut away grease and dirt that has collected on the metal surface prior to the application of the priming coat of paint. This assures a perfect foundation for the elaborate finish that follows. The workman is masked for obvious reasons.

TEST AIR LINES WHILE SHOP IS FLOODED BY CLOUDBURST

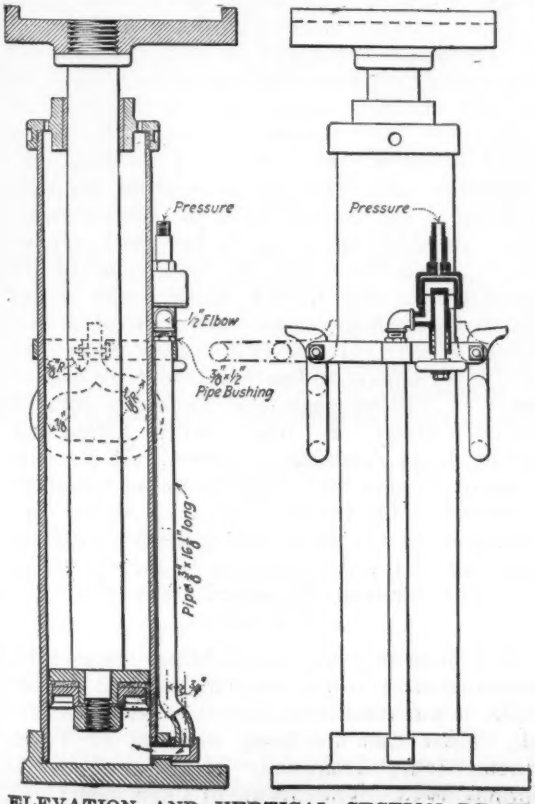
P. H. Trout, of Roanoke, Va., author of an article on determination of air leakage, which appeared in the July issue of COMPRESSED AIR MAGAZINE, writes to us under date of July 31 that there was a rather interesting sequel to the publication of his test formula. The plant with which he is connected was flooded by a cloud-

burst, and for 48 hours all the shop area was covered by water.

"We turned the air on the mains," he writes, "and easily located all leaks in the ground lines by the bubbles. We found that most of the leaks were at the various hose connections and through leaky valves. We also found quite a number of valves were partly open. We found only two or three leaks in the underground pipes, but one of these in a 'dead' line was very bad. It is gratifying to know that we have no underground leaks and can easily stop the greatest loss of air."

INTERESTING PNEUMATIC JACK FOR LOCOMOTIVE WORK

Mr. J. Long in *The American Machinist,* presents detailed, dimensional, working drawings of the interesting pneumatic jack here shown in elevation and vertical section, which has been found to render valuable service in locomotive repairs. Its principal use is for putting in place the heavy pedestal caps which, owing to their weight and the difficulty of getting them into the position they occupy, ordinarily require the services of two or three men to place them. The swinging handles at the sides of the jack will be noticed. These jacks are used in the pit, and to place a pedestal cap it is only necessary to put the cap on the top shoe of the jack, turn on the air and guide the cap to place. The cylinders are made of 4 in. extra-heavy wrought iron pipe, bored. The piston is of axle steel, and is fitted with a cup leather washer.



ELEVATION AND VERTICAL SECTION DRAWINGS OF JACK FOR LOCOMOTIVE WORK.

RAPID AIRPLANE DEVELOPMENT

The following statement of the National Advisory Committee for Aeronautics shows the development in airplanes which has been made since 1903. The first man-carrying airplane flights were made in December, 1903, with the Wright Bros. engine, developing 12 hp. and weighing 152 lb., or 12.7 lb. per hp. In 1910, the average horsepower for aeronautic engines had increased to 54, and the weight had decreased to 5.7 lb. per hp. After another 7 years, in 1917, the average power output had advanced to 243 hp., and the weight had decreased to 2.8 lb. per hp.

In March, 1918, the Liberty motor developed 432 hp. for a weight of 808 lb., or 1.86 lb, per hp. At present, the Liberty motor is developing a maximum of 450 hp. for a weight of 825 lb., or 1.83 lb. per hp.

The average consumption of fuel decreased from about 0.8 lb. per hp. in 1903 to 0.55 lb. in 1918, and for the Liberty engine to 0.50 lb. The present consumption is about 0.46 lb. per hr.

For one horse power of energy expended $500 worth of textiles is produced, $300 worth of iron or steel, $1700 worth of printing. In the textile industries, where the cost is not exceptional, the cost per horse power is calculated to $20 or $30, indicating a power cost of 5 per cent. of the total cost of production. Development of a river of electrical energy is suggested, stretching from New England to the Southern States, and the transformation of coal to power in the mining fields, instead of transporting it over the railroads to factories far and near.

A total of 81,741 disabled soldiers and sailors have registered for vocational training with the Federal Board for Vocational Education, Washington, and 2079 have started their training. Of the 4376 cases approved for teaching by the board, 1200 have been approved for trade and industrial training, 846 for agricultural, 850 for professional courses, and 392 are taking academic courses. Those taking up some branch of mechanics involving operation, repair and up-keep of gas engines number 291.

HOW SOME OLD AIR RECEIVERS WERE CONVERTED INTO COAL STOVES.

SCRAPPED AIR RECEIVERS FOR COAL STOVES

The half-tone tells practically all there is of the story. Mr. Thomas P. O'Connor, Master boilerworker at the Navy Yard, Philadelphia, received an order that he promptly provide thirty coal-burning stoves of a type and size suitable for the care and preservation of boilers and machinery of vessels to be put out of commission. Inquiries were made of several establishments, and the best offer was $41 for each stove with delivery thirty days from order.

One of the boilermakers found in the scrap-yard twenty-four seamless air tanks which had been discarded. It was found that they were of the right size for the purpose and they were at once converted into coal burning stoves as seen in the illustration.

Two of the receivers unconverted are seen at the left of the picture.

The total cost for changing each one was slightly less than $7, thus making a total saving to the government of $816.

C. Raymond Messinger, vice-president and general manager Chain Belt Co., and Sivyer Steel Casting Co., Milwaukee, Wis., who returned home lately from a three months' tour of Great Britain and the continent, says the financial situation and import restrictions imposed by European nations does not present an immediately encouraging condition to American manufacturers, although he looks to see an exporting movement possible this autumn.

Director-General John Barrett of the Pan-American Union is authority for the statement that as a result of war conditions the United States is buying and selling more with Latin America than all the other countries of the world put together. This condition, of course, will not last unless the commercial and financial interests of the United States are alert and are ready for the competition which is surely ahead of them. It is necessary in this connection to understand the facts about the relationship of the United States to German trade. The figures in 1913-1914, the last fiscal year before the war show that the total value of the commerce of the United States with Latin America was $800,000,000, that of Great Britain $650,000,000, and that of Germany $500,000,000, or $300,000,000 less than that of the United States. Fifteen years ago Germany led the United States in trade with fifteen or twenty Latin American countries. At the outbreak of the war the United States led Germany in fifteen of the twenty countries. At the conclusion of the war the United States has a greater trade with Latin America than all the rest of the world and Germany has practically nothing.

The three new Bureau of Mines rescue cars, construction of which was long delayed on account of war conditions, have now been completed. These cars are being stationed at Terre Haute, Ind.; Ironwood, Mich.; and Rock Springs, Wyo. The cars are of a new model and are well equipped in every way.

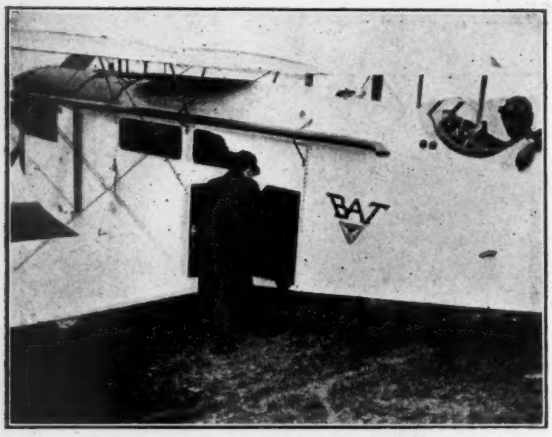
Women in Bri tish Industries

1—GIRL WORKING A HUGE CRANE IN THE WORKSHOP OF AN ENGLISH SHIP-BUILDING YARD.
2—PAINTING ROOF GIRDERS ABOVE RAILS IN A RAILWAY RECEIVING STATION OF AN INDUSTRIAL PLANT.
4—WOMAN FEEDING AN AUTOMATIC STOKER OF A FACTORY POWER PLANT.
3—CRANE GIRL IN A SCOTTISH PLANT.

In the course of the war and since the war, women have played a large part in the industries of Great Britain. As in the United States, it is likely that a large number of women in England and Scotland will continue in their emergency occupations and the subject is one that is taking the attention of those solving labor problems. Thousands of women workers on both sides of the water have registered vigorous protests against giving up the foothold they have obtained in the industrial fields, where a considerable percentage have performed manual labor that was formerly considered only in the province of men. There have been sharp debates whether women do their work as acceptably as men, "equal pay for equal work" being a resultant issue.

ENGLISH AERIAL LIMOUSINES

Airplanes especially built for commercial use are now being employed by the enterprising British. The capacity of the particular machine



Photos copyright, Keystone Photo News Co., N. Y.
FIG. 1.

shown in Fig. 1, is one ton, and it will accomodate in comfort, even luxury, four passengers.

FIG. 2.

It is all enclosed and fitted up somewhat as a limousine, with glass windows and with shades. You may smoke in its commodious interior and also enjoy all the conveniences of a closed automobile. Fig. 1 shows a passenger entering the saloon of a "Bat" airplane, the first machine to be constructed for strictly commercial purposes and to be made ready for the air in England.

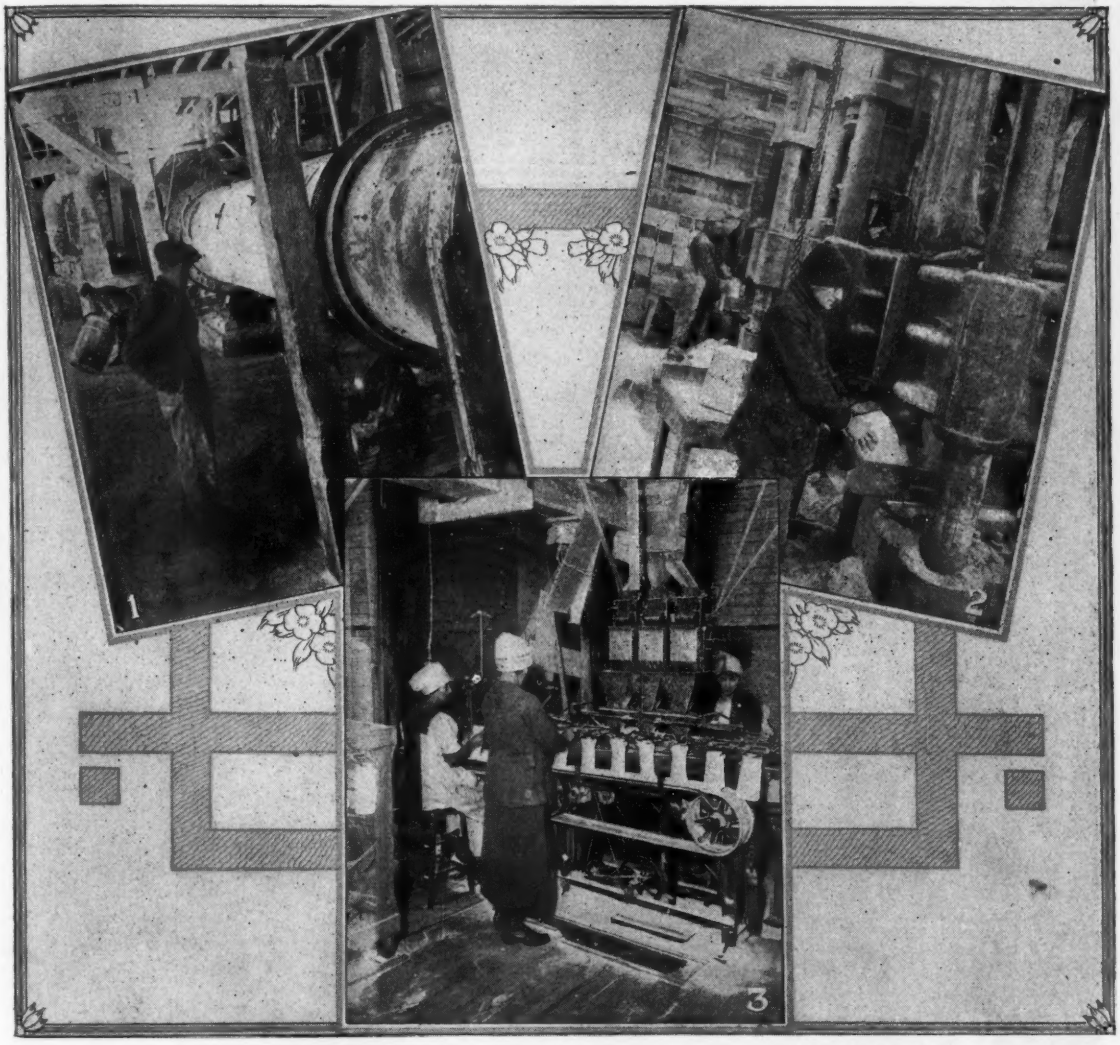
Fig. 2 shows the interior of a Bristol triplane, the latest multi-passenger airplane, which is fitted with a promenade deck. Our photograph shows the entry of a passenger through the pilot's trapdoor, the view having been taken from the interior of the large fuselage. Nowadays English passengers can have their choice of an air limousine all to themselves, or they can join the happy crowd (and "crowd" is the word) in an air omnibus. Civilian flying is now common between England's large cities and many of the suburban business men are going to work in their airplanes, landing just outside city limits where automobiles await them.

The reader may have noted the facts contained in the editorial in the August issue entitled, "The Age of Air Begun in Both Europe and America," which indicates Britain's lead over America.

VOCATIONAL EDUCATION FOR DISABLED SOLDIERS

It is not generally known that the Federal Board for Vocational Education maintains a course designed to prepare disabled soldiers for civil service positions. There are 32 men now studying to qualify themselves for positions under the civil service, and the Board will undertake to prepare any student who so desires, provided he can qualify as physically competent to do the work. Of course there are some regulations regarding these positions and men obviously handicapped cannot expect to hold down jobs where their physical disqualifications are such as to prevent the proper discharge of the duties. But on April 16 the President authorized an amendment to the civil service rules which permits the civil service commission to exempt from the physical requirements established for any position, a disabled and honorably discharged soldier or sailor or marine upon the certification of the Federal Board for Vocational Education that he has been specially trained for and has passed a practical test, demonstrating his physical ability to perform the work sought. Under the law a disabled soldier has a preference on the civil service list.

The following officers have been elected by the Leavenworth & Topeka R. R.; O. B. Goffler, vice-president, Topeka, Kan.; George Hanna, treasurer, Clay Center, Kan.; F. E. Harper, secretary, Leavenworth, Kan.



(Photos Copyright Underwood & Underwood.)

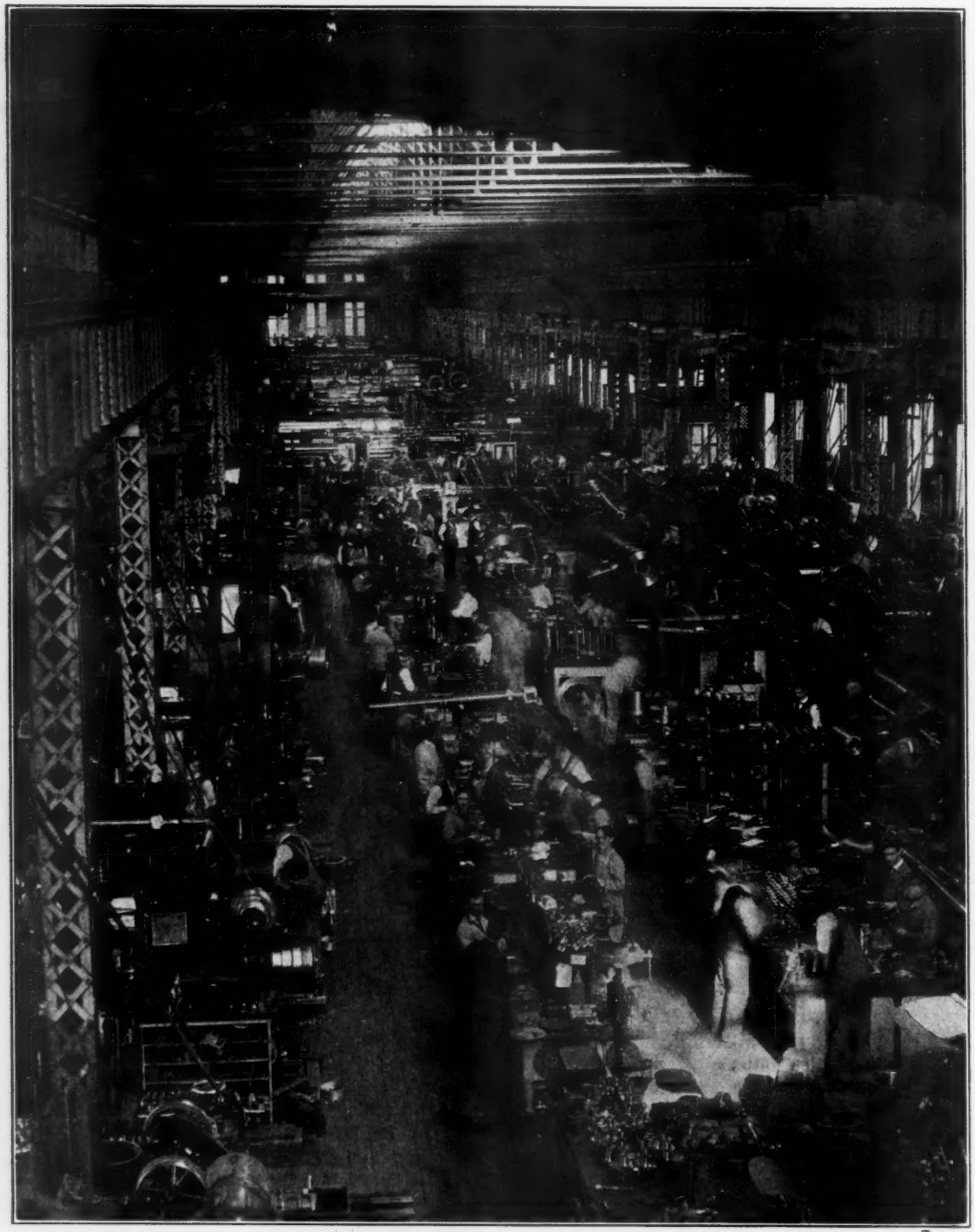
Compressed Air in the Salt Industry

1—EVAPORATION DRUMS IN A HUTCHINSON (KANSAS) REFINERY.
2—COMPRESSING BLOCKS OF SALT AT MILLION-POUND PRESSURE.
3—BAGGING SALT BY MACHINERY.

HERE WE are afforded some glimpses into the great salt industry of the Middle West and West in which compressed air is used extensively, especially in connection with the lifting of brine from the earth's depths to the surface. In certain of the localities, notably in Michigan, the brine is raised to the surface in its native state. In others there are solid salt deposits, which is nevertheless brought up to the surface from the wells in liquid form as hot water is forced through the beds.

This is the case with a refinery at Hutchinson, Kansas, where holes are drilled into the salt beds below the surface and hot water sent down to them to liquefy the salt. It is then pumped up to the drums such as are shown in Picture 1. After evaporation the salt is put into big bins to take the air and to dry out. Then it is screened into the various grades of granulation. The extra fine is put into small bags or boxes for table use, as shown in Picture 3. The coarser grades are packed in bags and barrels for use in meat and fish packing.

Some of the salt is pressed too into 45 pound blocks for the salting of livestock. The photographer reports that the pressure exerted by the pressing apparatus shown in Picture 2 is a million pounds.



One of Our Big Naval Gun Works

We show here a photograph we should have been prohibited from printing in war-times. It discloses the interior of the great Navy gun works at the arsenal, Washington, D. C. This affords an interesting glimpse of a big modern American gun factory, in which compressed air and pneumatic tools are used for scores of purposes. The photograph only faintly indicates the great size of the building.

3,000 H.P. FOR GIANT TRIPLANE

Great interest has been evidenced in American aviation circles in the giant triplane built in England, the largest thus far constructed, which has a wing spread of 131 feet and is 37 feet high. This machine was constructed for the Royal Air Force, the order having been entered before the signing of the armistice. The original purpose of the craft was that it be utilized in bombing Berlin. The equipment included eight guns and sixteen bombs each weighing 500 pounds.

If utilized for peace purposes, as anticipated, this great airplane will be able to carry more than fifty persons with ease within its fuselage. It was designed by W. G. Tarrant and built by the Tarrant Aircraft Construction Co. Trials of the machine are being made at Farnborough, Surrey, where it was assembled. This same company, it is reported, has designed another machine with a fuselage sixteen feet in diameter, capable of carrying ninety-two passengers.

The big bomber plane has a fuselage seventy-six feet long. The passageway is perfectly clear, there being no wires to obstruct the vision. The three tiers of wide planes are like the decks of a ship. The span of the middle plane is the greatest, measuring 131 feet, the planes above and below being 98 feet in length. The total resistance surface to the air of the three wings is about 5000 square feet.

Propulsion is provided by six Napier engines that develop a total of 3,000 h.p., four of them, of twelve feet, six inches diameter, being two-bladed, driving tractor screws arranged two in line between the middle and lower and middle and upper planes respectively. The remaining two are "pushers," at the back of the machine and are four-bladed screws ten feet, six inches in diameter.

The two pilots for this machine occupy seats up forward in the bow of the fuselage and are a dozen feet ahead of the planes and front propellers so that there are no obstructions to vision.

Aft of the pilots is the engineer's compartment, from which the engine-starting system is set running. Here, too, are the various levers for engine control. Vocal orders can be received from the pilots for starting, but the pilots also have a master control over the engines in case of need. Normally the tanks will carry 1,600 gallons of gasoline, but extra tanks can be carried to insure an extra supply for long flights, such as a trip across the Atlantic, if that is undertaken. The weight of this great triplane, which is said to provide a large safety factor, is eighteen and one-half tons when carrying an average load. This will give some idea of the great power required to lift such a bulk from the ground, this being a military land plane, not a seaplane. In its trial flights the machine carries a crew of five men. The actual performances of this monster of the air will be followed with attention by all aeronauts.

HOPE TO "WEIGH LIGHT"

Prof. W. W. Campbell of the Lick Observatory explains the problem of "weighing light" in his "Solar Eclipse Notes" in the *Publications of the Astronomical Society of the Pacific,* issued at San Francisco. Two British expeditions and at least one American expedition that went out to observe the total eclipse of the sun on May 29, expected to make their main business that of getting data to help solve the problem of weighing light. Prof. Campbell says:

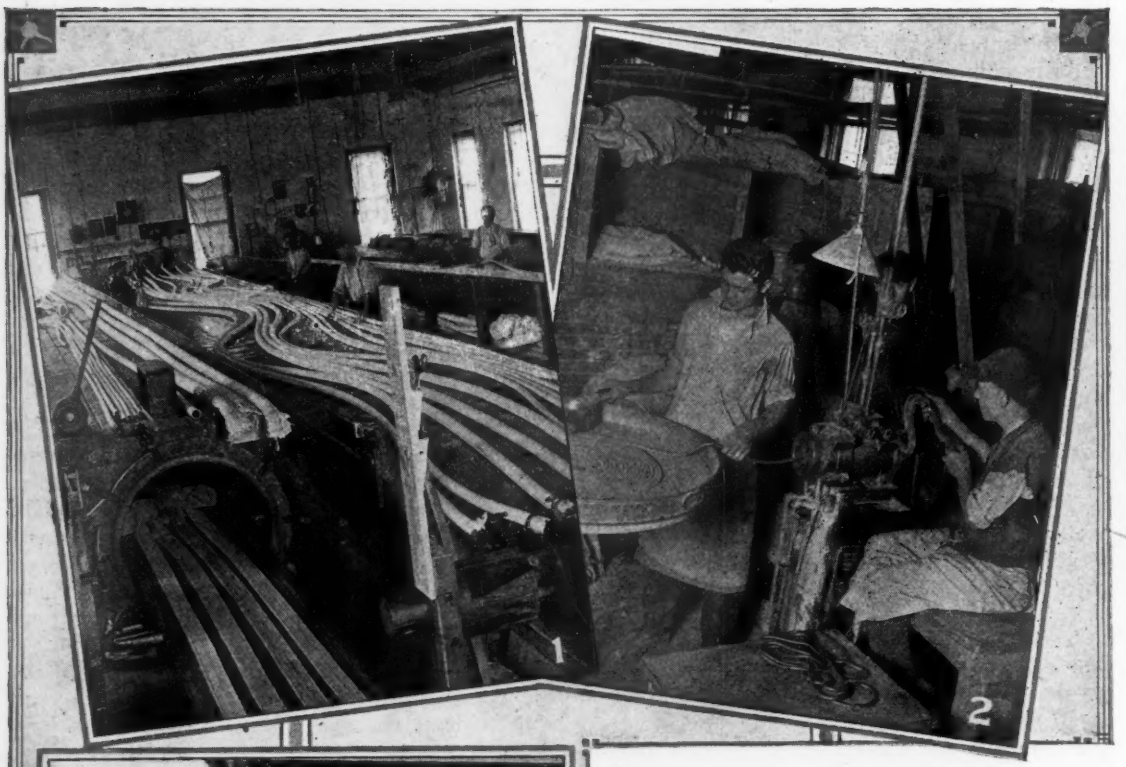
"According to certain hypotheses, light radiations possess mass and are subject to gravitational disturbance. If the hypotheses in one form or another represents the truth, then rays of light proceeding from stars which are seen very nearly in the direction of the sun should be deflected from their straight-line courses, as these rays pass close to the sun and through the sun's gravitational field.

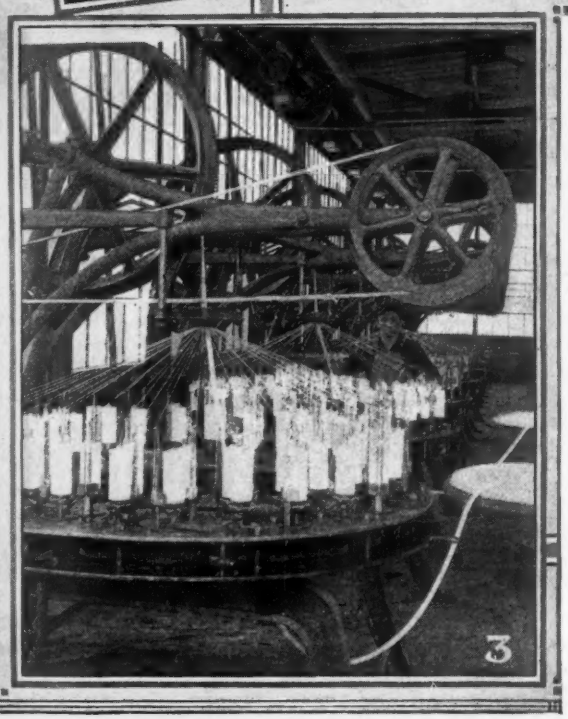
"If a ray of light coming from a star to the eclipse observer just grazes the edge of the sun but without touching the sun, it should be bent from its course in amount 0".87, according to one hypothesis, in twice this amount on another hypothesis, or not at all on a still different hypothesis. The eclipse of May 29 found the sun very favorably situated for the solution of this problem in the northern part of the Hyades cluster. A good number of stars in the photographic field, with the eclipsed sun in the center, may be recorded with an exposure of ten seconds or less. Many eclipses will come and go before another will be so favorable in this regard."

At this writing we have no news from either the American or the British expeditions. Much other interesting scientific data may be expected when results of the eclipse observations are made known.

The faithful 'tin derby,' which served so well on the battlefields of France, has now been drafted for peace service. The War Department suggests that the helmets can be used to advantage in occupations where there is danger of head injuries from falling objects. A hot rivet landing on a helmet may make some returned soldier beneath it think of old times, but it will simply bounce off and go on its way rejoicing without doing any damage.

Making Rubber Hose for Compressed Air Use





(Photo Copyright Underwood & Underwood.)

1—HOSE LAID OUT IN THE VULCANIZING ROOM OF A RUBBER FACTORY.

2—TURNING OUT SMALL AIR AND GAS HOSE.

3—BRAIDING THE OUTSIDE COTTON COVERING FOR HIGH-PRESSURE HOSE.

The above views were taken in a large rubber factory for COMPRESSED AIR MAGAZINE to illustrate the processes of making hose for the compressed air and pneumatic tool industries. Millions of feet of air hose a year are purchased in the American market, and the demand is constantly increasing along with the growth of the compressed air industry.

By far the largest aggregation of centrifugal pumping machinery for water-works purposes is that of Chicago, which includes 16 plants having a combined capacity of about 400,000,000 gal. per day, with over 60% of the volume lifted electrically.

PNEUMATIC DISTRIBUTION OF FUEL OIL

The simple and sensible arrangement here shown for the control of fuel oil distribution by means of compressed air was presented in a recent issue of *Engineernig and Mining Journal.* The assurance of its entire success in practice would seem to have been entirely superfluous. In the sketch here reproduced some necessary pipe unions seem to have been forgotten:

The equipment consists of three pressure-tight storage tanks. The high pressure air (50 to 60 lb.) is piped to these tanks and is controlled by the valves *A, B,* and *C.* Valves *D, E,* and *F* (when *A, B,* and *C* are closed), permit the exhaustion of the pressure from any tank whenever it is desired to refill that tank. In addition, each of these valves serves as an overflow in case a tank becomes too full. The supply of oil from the three tanks to the service line is controlled by the valves *H, I* and *J.* The valves *K, L,* and *M* are used in the filling or transferring of oil from one to the other of their respective tanks. The valve *N* admits oil to the manifold from the main storage or from an oil car. The valve *O* may be used for drainage or cleaning of lines. A few examples of the manipulation of the system will make its advantages more apparent:

1. To fill Tank 1 from main supply: Open *D,* make sure *A* and *H* are closed, and allow air pressure in tank to exhaust itself. Then open *N* and *K* and allow tank to fill by gage or until oil overflows at *D;* if there is no gage, then close *D, K,* and *N.*

2. To supply service line from No. 1 which has just been filled: Open *A* and then *H.*

3. To "change over" when No. 1 tank is nearly empty to No. 2, which is full, without interrupting the supply to line: Open *B,* making sure *E* is closed. Then open *I,* after which close *H* and *A.*

4. To transfer oil from No. 3 to No. 1 while supplying service line from No. 2: Open *B,* making sure *E* is closed, then open *I,* thus supplying service line from No. 2. Open *D,* making sure *A* is closed, and exhaust pressure from No. 1; then open *C,* making sure *F* is closed; then open *M* and *K* and allow No. 1 to fill from No. 3. When No. 1 is filled, close *D,* then *K, M,* and *C.*

5. To fill No. 1 from No. 3 while supplying service line from No. 3: Open *C,* making sure *F* is closed; then open *J,* thus supplying service line from No. 3. Open *D,* making sure *A* is closed, and exhaust pressure from No. 1. Then open *K* and open *M* as far as possible without lowering the service-line pressure at gage *P* below the minimum required, and allow No. 1 to fill from No. 3. When No. 1 is filled, close *D,* then *K* and *M.*

6. To partly fill only one of the three tanks from either of the two others, without having an employee watching it, e.g. to fill No. 1 from No. 3 while supplying service line from No. 3; Open *C,* after closing *F,* then open *J.* Open *D, A* remaining closed. Open *H* as far as possible without lowering the pressure on service line below the required minimum,

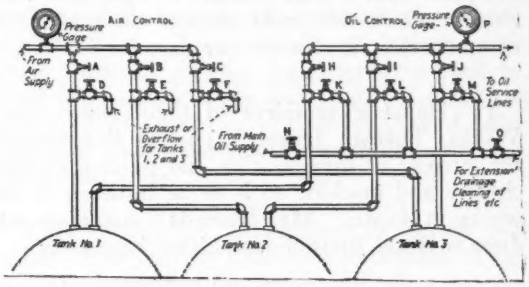


DIAGRAM SHOWING SYSTEM.

and after the air pressure has been exhausted from No. 1 tank, close exhaust valve *D* and allow No. 1 tank to fill, compressing the air in No. 1 tank from atmospheric pressure to the same pressure as No. 3 tank, thus having No. 1 tank almost full of oil with air pressure high enough to use immediately, and no possibility of an overflow.

This system of distribution is not only fundamentally simple, but covers every contingency and insures an uninterrupted flow to the service lines. It can be made up of standard pipe fittings, and is so arranged that it may be readily added to or extended.

William Wharton, Jr., & Co., Inc., at Easton, Pa., a subsidiary of the Taylor-Wharton Iron & Steel Co., is installing tools and equipment for the production of seamless steel gas cylinders used for the transportation of compressed gases.

The coefficient of heat transference in condensers, or the number of heat units transferred per hour through 1 sq. ft. of metallic condenser wall when the temperature of the steam is 1 deg. F. higher than that of the water, for various metals of the usual thickness or about 0.04 in., is fairly well established for ideal conditions and may be given as 18,430 for brass, 61,500 for copper, 11,270 for iron, 5,740 for zinc, 11,050 for tin and 2,660 for aluminum. In everyday practice, however, little difference is observed between copper and iron tubes.

Notes of Industry

The Eureka Vacuum Cleaner Company, Detroit, has erected a new plant which it claims is the largest exclusive vacuum cleaner factory in the world. The building is three stories, covering an area of over 19,000 sq. ft. and over 60,000 ft. of floor space is provided. The plant is equipped with a vast amount of up-to-date machinery which will make possible the production of 1,000 electric cleaners per day.

H. Hamada, president of the Tokoyo Gear Works, Tokoyo, Japan, is visiting this country for purpose of investigating and purchasing machinery and machine tools to be installed in his works in Japan. Mr. Hamada's American address is Hotel Bretton Hall, New York City.

During the daylight saving season last year, the Edison Electric Illuminating Co. of Boston saved 4420 long tons of coal because of the extra hour of daylight utilized by turning the clock one hour forward. The decrease in kilowatt-hours from this cause was 5,000,000, representing a loss of revenue of about $350,000.

The Carnegie Institute of Technology, Pittsburgh, Pa., has recast its four-year course in mining engineering and has established a two-year course in coal mining. The latter course will be open to men who have a common school education and two years' experience in or about the mines. The changes are the result of a conference held a few weeks ago between 25 representatives of the coal mining industry in western Pennsylvania and President Hamerschlag. The idea is to attract more trained men to the mines and to give to the young men now employed an opportunity to advance themselves to more responsible positions. A board of mine operators and engineers is to be created to serve in an advisory capacity and the course will also have the cooperation of the United States Bureau of Mines.

The performance of a heating furnace utilizing a fuel composed of pitch and creosote is reported in the engineering supplement of London *Times*. Two tons of steel billets were heated in 55 to 60 min. to 2000 deg. Fahr. using about 16 gal. of the fuel per hour. The internal size of the furnace is 10x5x3.5 ft. Equal weights of creosote and pitch form the mixture, which is kept at a temperature of 180 deg. Fahr., and, strained through a wire gauze strainer of 40 meshes to the inch, is pumped through an injector type of burner.

During the threshing season Indiana reported that gas masks were in demand for threshing and shipping wheat infected with the Australian "take-all." All grain was so infected with the fumes of formaldehyde that the endurance of workers was tested. Wheat from infected districts is held by the United States Grain Corporation at New York for investigation.

Interest has been created throughout business circles in the United States by the declaration in Congress of Representative Moon that it is possible to establish one-cent letter postage and yet permit the Postoffice Department to earn a surplus of $25,000,000 a year, provided other classes of mail are made to pay cost of handling.

The Commercial Travelers of America, some 30,000 strong, have declared war on promoters of fraudulent stocks, and have announced their intention of carrying a warning to every city, town and village in the territories they cover against fictitious stocks and get-rich-quick investments. They are also to make war on dealers that make a practice of buying War Savings Stamps and Liberty Bonds, below their real value, from unsophisticated persons.

Legislation is sought permitting the Navy Department to continue handling commercial radio messages to and from ships at sea and between shore stations. Secretary Daniels has declared that "an intolerable situation in the business world" is threatened because of the inadequacy of the commercial communication systems of wireless. Aside from the American Marconi Company, which is of course controlled from abroad, there is now no great American wireless corporation providing general service.

The United States Geological Survey announces that the Black Hills Mining District of South Dakota produced $6,565,209 in gold and 159,246 ounces of silver in 1918. The Survey is also authority for the statement that the value of precious stones produced in the United States annually since the beginning of the twentieth century has been about one-third of a million dollars. Since 1914 the annual value of output has dropped considerably.

There are 200 engineering societies in the United States, with a total membership of 100,000, the annual dues amounting to $1,000,000. There are possibly 200 other societies more or less connected with engineering, and having many engineers as members. Probably 100,000 other engineers do not belong to any society.

There have been rumors that the railroads would be returned to private control on October 1, such rumors having been the result of plans to have the Congress enact legislation at that time. Information from Washington as we go to press is that the President himself has given no consideration to the railroad problem since his return. Advocates of the Plumb bill are said to be informed that there will be no return of the railroads before January 1 next.

The high cost of living has become a most acute political question in all European countries. It is rapidly becoming such here. Observers of the materials and commodities markets in this country, who have been making dispassionate and careful calculations, are of opinion that in America a rising rather than a lowering of the scale of prices is to be anticipated, unless a wise course of action is taken to prevent it.

Britishers are about to raise a fund of some millions in the United States for the relief of British subjects who left here to fight and who will not be able to get relief from their home government. Other interests, we learn from Washington, are to raise a heavy fund here for the relief of Germans in Germany.

The Edge bill was reported favorably, as was an amendment putting the Federal Reserve banking system at the service of the new export banks, by enabling the latter to rediscount their paper. This amendment was added at the request of the Federal Reserve Board, and is virtually a substitute for the system advocated by Senator Owen.

The Director of the Air Service announces that there will be offered at low prices to colleges and schools desiring to teach aeronautical engineering, an accumulation of miscellaneous airplane motors and unserviceable airplanes that were used for instruction purposes.

It is reported from San Bernardino, Cal., that no less than 11,500 men, women and children are now employed in canneries of this interior district of Southern California.

The Carnegie Steel Company is canvassing its employes at Youngstown, according to the *Wall Street Journal,* to ascertain their views on coöperation between company and employe in the building of homes. The United States Steel Corporation is fathering a movement for workmen's homes through its real estate subsidiary.

The United States Shipping Board is to build two gigantic ocean racers larger and swifter than anything now afloat. They will be 1,000 feet in length, 102 feet in beam and will make 30 nautical miles an hour, or 34 land miles an hour, enabling them to make the transatlantic crossing in four days. They will be oil burners with steam turbines driving four screw propellers. Two other ships of the same type are also projected. Fort Pond Bay, at the upper end of Long Island, is under consideration as the terminal for these great ships.

The first "strike" of aviators in history was called off on July 25 pending a settlement of the differences between the aerial mail pilots and the United States Postoffice Department. Pilots objected to going aloft against their best judgment in bad flying weather and also asked for minimum pay of $3,600 a year.

What was said to be the largest airplane engine in the world was recently put under its first test at Wolverhampton, England. It was reported to be of 1,000 nominal horse power and to develop about 900 horse power at normal working speeds.

A news dispatch cabled from London declares that the successful trips of the British dirigible airship, R-34, have prompted American and British financiers to consider the formation of a $30,000,000 transatlantic corporation to be called Aglo-American Airships, Ltd.

The State Department comments on the existence of large and important oil deposits in the vicinity of Mapimi, State of Durango, Mexico, a discovery believed in Mexico City to be the result of prospecting operations.

Uncensored wireless and postal communication with Germany began in July. Soldiers' mail arriving from France was still being censored by the army on Aug. 1. It is understood that all passport regulations of wartime character will be lifted by the State Department on November 15. The world is gradually getting back to peacetime normal, despite economic uneasiness.

BLASTING PRACTICE IN JOPLIN ZINC DISTRICT

IN THE JOPLIN zinc district, embracing the territory adjacent to Joplin, Mo., the Webb City sheet-ground deposits and the mines of Ottawa County, Oklahoma, and Southeastern Kansas, the ore bodies present unusual conditions, which affect and determine the drilling and blasting. An interesting description of the methods employed in this district is given by Mr. R. H. Sumner in the *Du Pont Magazine*.

In describing the blasting practice of this district, the mines may be divided into two classes, namely, the "sheet ground," which embraces most of the Joplin-Webb City section, and the irregular deposits or "runs" which apply to most of the Oklahoma-Kansas mines.

The ore deposits of the "sheet ground" lie in horizontal sheets of a generally uniform thickness and extend over large areas. The mineral content is more or less uniform, the zinc and lead sulfids occurring imbedded between the layers of chert and in crevices or small openings.

Shafts, usually 5 by 7 ft., are sunk a depth of from 175 to 300 ft. to the bottom of the ore body. Electric blasting is now used almost entirely for shaft work. The center cut system is used, usually with four cut holes, four relief holes and four corner or squaring up holes. Instantaneous electric detonators are used in the cut holes; first delay electric igniters in the relief holes and second delays in the corner holes.

Gelatin dynamite of 35 per cent. and 40 per cent. strength is used in charging the holes. When charging is complete, the shots are all connected in series and fired by blasting machine after all men are well away from the shaft.

Drifts are run out from the shaft into the ore body in all directions, except, of course, in the narrow "run" deposits where the drifts follow the ore. Pillars from 20 to 40 ft. in diameter are left to support the roof, spaced according to the height of the ore body and the condition of the overlying material.

Air-hammer drills with water attachment are used almost exclusively, although there are some piston drills. The starting bit is from 2½ to 3 in., guaged every 2 ft. down to from 1¼ to 1½ in. The hard, brittle flint wears steel exceedingly fast. This fact along with the open ground, drilling into crevices and changing ground makes drilling difficult and affects the blasting practice to a great degree. Often a well-balanced round is spoiled by drilling into an unforeseen opening, and, again, the bore hole must be placed at a disadvantage because of a known crevice or pocket. The character of the material blasted is responsible for the practice of chambering, locally known as "squibbing," the bore holes, so that a greater quantity of explosives can be charged, and hence more tonnage realized per foot of drilling. Experience has demonstrated that the increased quantity of explosives used is often more than compensated for by the saving in drill steel and labor costs.

Breaking the ore in the headings may be divided into three classes:

DRILLING AND BLASTING IN LOW ORE FACES

Where the ore face is low (see Fig. 1), from 7 to 12 ft., the round of holes is drilled so as to blast out the entire face at one setting.

From four to eight holes, 8 to 12 ft. deep, are drilled per round. This class applies chiefly to sheet ground deposits.

Five holes is an average round with two breast holes, two roof holes and one lifter, locally called a "stope" hole. This is somewhat confusing as there is no differentiation in momenclature of the real "stope" hole and the bottom hole in the heading or cutting in round. A round of holes of this kind is drilled ordinarily a little deeper than the height of the heading being driven and are burdened so that the round will break almost as much across the toe as the depth of the hole. The holes are chambered and blown out by the drill man and, later, charged and fired by the powder man.

In higher faces of ore (see Fig. 2), from 12 to 70 ft, the heading is driven at the top of the ore body, with machine mounted on 6 to 8 ft. posts. The material left on the bench below is taken up by underhand stoping in one or more benches, depending on the vertical extent of the ore. The heading is carried ahead of the stope just far enough to permit the machine men to work. In this way the blasted material from the heading rolls down the stope by gravity and obviates shoveling in the heading. From five to eight holes, 6 to 10 ft. deep, are drilled per round in the heading.

After drilling is completed, the machine man chambers, when his judgment or that of the powder man indicates, with from 1 to 2½ lb. of explosives. Each hole is then blown out with a blower attached to the compressed air hose, leaving the holes clean and free from the cushioning effect of dust or rock particles. In some mines where the material is easier breaking, chambering is found unnecessary in the heading holes.

The horizontal holes (stope holes) driven in the bench below are 12 to 14 ft. deep and carry a burden from 10 to 12 ft. A stope hole of this kind fairly squared up on the collar will break from 150 to 200 tons.

Stope holes are chambered once, twice or more

times as the burden on the hole and hardness of material may demand. The best judgment of the mine foreman, powder man and machine man must be used in chambering stope holes, particularly in the irregular deposits of Oklahoma, for one hole may be bottomed in a solid chert or dolomite boulder, while the next may be in a soft ore pocket or even in a cave. The size of the pocket governs the quantity of explosives charged, and it is difficult to secure approximately just the right size chamber. Because of this variable condition, a hole will sometimes be lost, due to underloading, and, again, a hole will be charged with a much greater quantity than is actually needed. It also happens in open crevicy ground that an open-

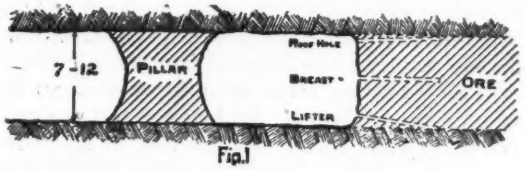


Fig.1

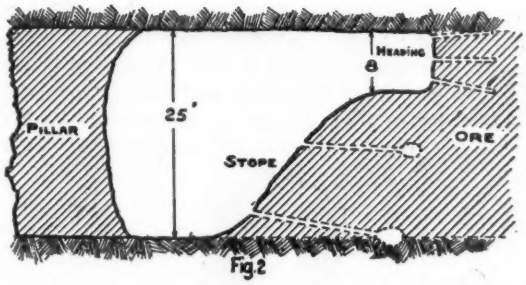


Fig.2

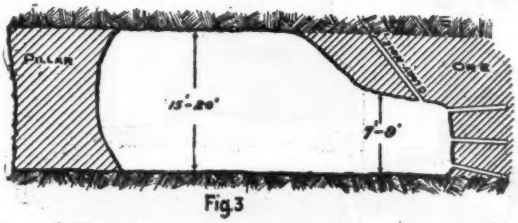


Fig.3

ing near the toe of the hole will cause the explosive force of the gases generated by detonation to be uselessly dissipated.

MODIFIED OVERHEAD STOPING

When the ore face is in material of sufficient hardness, so that the overhanging rock will not slab or fall down (see Fig. 3), a modified overhead stoping is economically used. It is almost the reverse of the method just described, the heading being advanced at the bottom of the ore body on a 6 to 8 ft. machine post. When the heading is advanced from 15 to 25 ft. ahead of the overhanging material, holes called "glory holes" are drilled 10 to 12 ft. deep slanting backward and upward 45 degrees from the face. The heading holes and glory holes are chambered and prepared for charging as described above.

EXPLOSIVES USED

About every kind and strength of dynamite has been used, from 17 per cent. "straight" nitroglycerine up to 80 per cent. gelatin dynamite. The tendency the last two years has been toward the use of lower grade dynamites with a stronger detonator. The results produced indicate this to be good practice, provided the grade is not too low, causing the miners to do more chambering. The extra grade dynamites of 30 per cent. and 33 per cent. have proved very efficient when used with a No. 8 detonator.

In wet or close work, when ventilation is poor, in shaft sinking, raises or drifts, gelatin dynamites are used. In open stope work, 30 per cent. and 35 per cent. gelatin will usually meet all requirements.

Since the introduction of lower grade "extra" and gelatin dynamites, fatal accidents have been materially reduced, due to these explosives being more insensitive to shock than the straight dynamites. There still exists, however, in some mines, the bad practices of "short fusing" on the chambering, shots, and chambering on shift. Those practices go hand in hand, as the object of "short fusing" is to shorten the time wasted by all the men within range of the shot.

LOADING BORE HOLES

The charging of the bore holes is usually done by a powder crew after the drilling, chambering and blowing out of the holes is completed by the drill man. The dynamite cartridges are slit and stuck on a copper spike inserted into the end of the wooden tamping bar, held on by a copper ferule, which also serves to keep the bar from being quickly worn by the sharp projecting points of chert.

The primer cartridge is usually placed near the top of the charge with two or three cartridges tamped on top. Fuse is cut in 8 or 10 ft. lengths and trimmed at least 6 in. to effect the proper rotation of shots. Tamping material or stemming is rarely used, and there are some logical reasons for this fact. First, there is an absence of a good tamping material; the best available is to fill tamping bags with fine tailings from the concentration tables. If these are absolutely dry they make very poor tamping, and if damp the bag breaks and is pushed into the rough bore hole with attendant difficulties. Secondly, in the general practice there are always some holes nearby that are heavily burdened near the collar as on the toe. If the material is soft or

crevicy at the toe and the hole is tamped or stemmed there is a good chance of shooting out the back end and leaving the front part of the hole "hanging in the wall."

The primer cartridge is almost always made by lacing the fuse transversely through the cartridge and inserting the cap obliquely into the side. A safer and more efficient way is to tie the fuse to the cartridge with a piece of string and eliminate the liability of igniting the charge from a spit size of the fuse.

HIGH EFFICIENCY OF COMPRESSED AIR FOR BLOWING

There is probably no employment of compressed air, at the familiar working pressures of six or seven atmospheres, which in actual practice shows on the one hand a more wasteful and on the other hand a more economical use than for blowing blacksmith fires or metal furnaces. There is also no, topic to which our correspondence shows more frequent reference. The following views of Mr. A. C. Delfield in the *American Machinist* will be welcomed by many readers for the clear and precise information it gives upon this interesting subject.

The use of compressed air for blowing fires in drill sharpening and blacksmith shops, steel fabricating plants, car shops, shipyards, structural shops, bridge and building erection, etc., is common practice. In fact wherever compressed air is available its convenience generally leads to its use for this purpose. It has frequently escaped attention that it is extremely bad practice to compress air to 100 lb. or other high pressure and then throttle it down to a fraction of an ounce, which is all that is necessary for blowing a fire if the necessary volume is supplied. This fact has lately been brought sharply to attention by the intensive shipbuilding program in this country which called for air plants of unusual size. The United States Shipping Board has investigated the subject thoroughly and in the published results issued by the Steel Ship Division it is stated as follows:

"The average air used by a rivet furnace runs from 20 to 40 cu.ft. per minute. The use of high pressure air in a great majority of shipyards is not only overtaxing the capacity of the air compressor plants in many cases, but is resulting in a waste of power that does not seem to have been generally appreciated. A large percentage of high pressure air now used for this purpose can be saved by the application of a jet siphon. The high pressure air passing through the nozzle of the siphon draws in a liberal quantity of free air which is mixed with the initial air. The percentage of induced free air taken in depends entirely on the design of the siphon blower, and runs from 30% in some of the crude arrangements which have been improvised by some of the shipyards to 75% or 80% for the best standard makes of siphons which have been carefully tested out by the Standard Practice Branch of the Emergency Fleet Corporation." (Since the above results were reported, the blower described in this article, Fig. 1, has exceeded 95% of free air induced, as shown by data below.)

What a blower of this type means in dollars and cents is readily determined. The cost of compressed air per 1,000 ft. ranges from four to ten cents, depending on the location and size of the plant, cost of power, etc. A fair average for a good sized plant is six cents per 1,000 ft. This covers the coal or electricity purchased, labor, oil, supplies, etc. and fixed capital charges. A single small rivet-heating forge at an average of 30 ft. per minute, or 1800 ft. per hour, would use 14,400 ft. in eight hours and the cost at six cents per 1,000 ft. would be 86.4 cents per eight-hour shift. In 25 working days of eight hours each, this would amount to $21.60 a month or $259 a year for one forge. Multiplying this by several hundred forges will give a very impressive total. The blower here described and illustrated will operate one of these forges on an average of 2 ft. of air per minute, or 960 ft. in eight hours at a cost of 5.76 cents a day, or $1.44 a month, a clear saving of over $20 a month per forge.

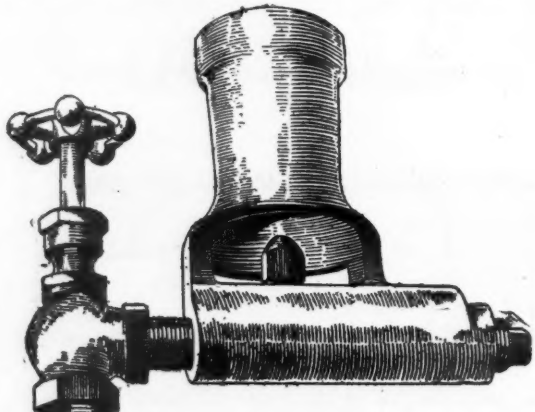


FIG. 1—SIPHON FORGE BLOWER AND NEEDLE VALVE.

The construction of this blower as shown in Fig. 2 comprises a needle valve *V*, a jet chamber *C* with strainer *S*, a high-pressure-jet nozzle *N*, with orifice proportioned to give a high velocity to the issuing compressed air, and a bell-mouth blast tube *B* to induce free air and transfer the kinetic energy of the small high-pressure jet to a large volume of air at a low pressure. The orifice

of the high-pressure jet at its smallest section is 1-16 in. in diameter. The volume flowing depends on the pressure admitted by the needle valve into the jet chamber. When starting a fire or bringing up a heat quickly, full pressure may be admitted, but in normal use the pressure acting on the jet needs to be only about 20 lb. or less. Tests on this blower give the following results:

Pressure in Jet Chamber C, Lb.	High Pressure Air Consumed Cu.Ft. Free Air per Minute	Draft in In. of Water Pressure	Total Volume Air Delivered, Cu.Ft. per Minute	Ratio Air Delivered to air Consumed
80	5.3	4.25	77.3	14.3
60	4.2	3.35	68.7	16.0
40	3.1	2.35	57.5	18.5
20	1.9	1.2	41.1	21.6

To secure this high economy the hole in the high-pressure jet must be small and properly formed, and all the proportions and arrangements of the blower worked out to the best advantage. A necessary feature is the strainer in the

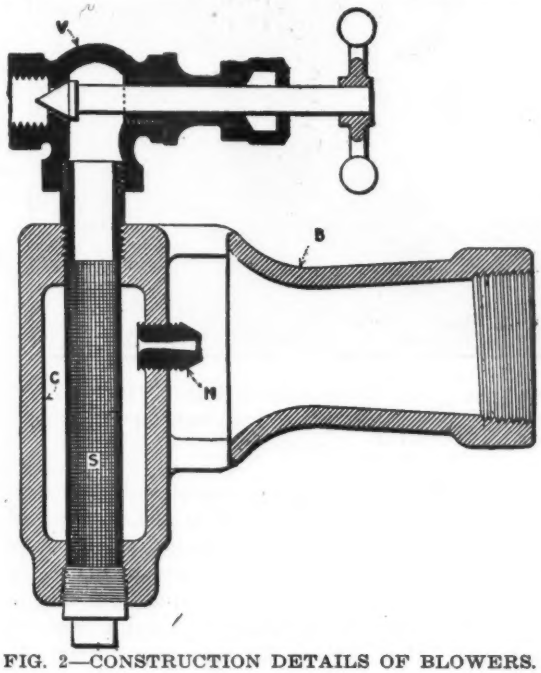


FIG. 2—CONSTRUCTION DETAILS OF BLOWERS.

chamber *C* through which the high pressure air must pass before reaching the jet nozzle. This prevents the small jet orifice becoming choked with grit, pipe scale or fragments of rubber from the air hose, which are always present in compressed-air lines.

The above data are obtained from tests on a "wind-box" and not directly on a forge, as it is very difficult to get a measurement of the low-pressure air going to the forge. It is possible, however, to measure the amount of air used when it is all taken from the compressed-air line and a comparison can then be made on the same fire under the same conditions of fuel bed and draft, which will give a direct comparison of the two methods. A test of this kind was made on a small cast-iron rivet forge used in a shipyard. This forge has a grate 10 in. in diameter and the fire pot is of the usual flaring form about 12 in. inside diameter at the top. The thickness of fuel bed was 6 in. of pea coal. Air was first taken from the high-pressure air hose, no free air being induced, and the flow measured with an air meter.

Readings of the static draft in the ash pit under the grate were taken simultaneously with the meter readings. The blower was then connected and the needle valve adjusted so as to give the same draft readings as before. The difference between the high pressure used in this case and when blowing the fire direct without the blower, is a measure of the air induced by the blower under actual conditions of forge operation.

Draft in In. of Water Pressure	Ash Pit, Cu.ft. Free Air per Minute Taken from High Pressure Line Without Blower	With Blower	Efficiency of Blower
0.35	36.4	1.35	96.3%
0.7	52.4	2.52	95.2
1.35	59.3	4.76	92.0

It was noted that with 0.35 in. of draft there was a good slow fire, with 0.7 in. draft there was an active hot fire of rather greater intensity than the average required, and with 1.35 in. draft there was a very intense fire such as would be rarely required. As nearly as can be determined an average working condition would be 0.5 in. of draft, 45 cu.ft. free air per minute required without blower, 1.93 cu.ft. of high-pressure air required with blower, and efficiency of blower under this condition 96%; in other words only 4% of the necessary air for blowing the fire has to be drawn from the compressed air supply, the remaining 96% being induced from the free atmosphere.

What is considered to be the largest individual transaction in linen in England was the sale of 40,000,000 yards of linen intended for use on airplane wings by the Aircraft Dispersal Department, of the British Government. The price paid for the linen is given as £4,000,000.

A new mineral has been discovered in Siberia. The discovery was made by a hunter on the shore of Lake Balkash, and the mineral has been named Balkashite. It has the appearance of dark-brown hard rubber, and when ignited it burns with a strong flame, leaving about 2 per cent. ash. When placed in water it becomes a mass very much like paraffine..

Compressed Air Equipment in Department of Engineering, Johns Hopkins University, Baltimore, Md., used for demonstration and experimental purposes

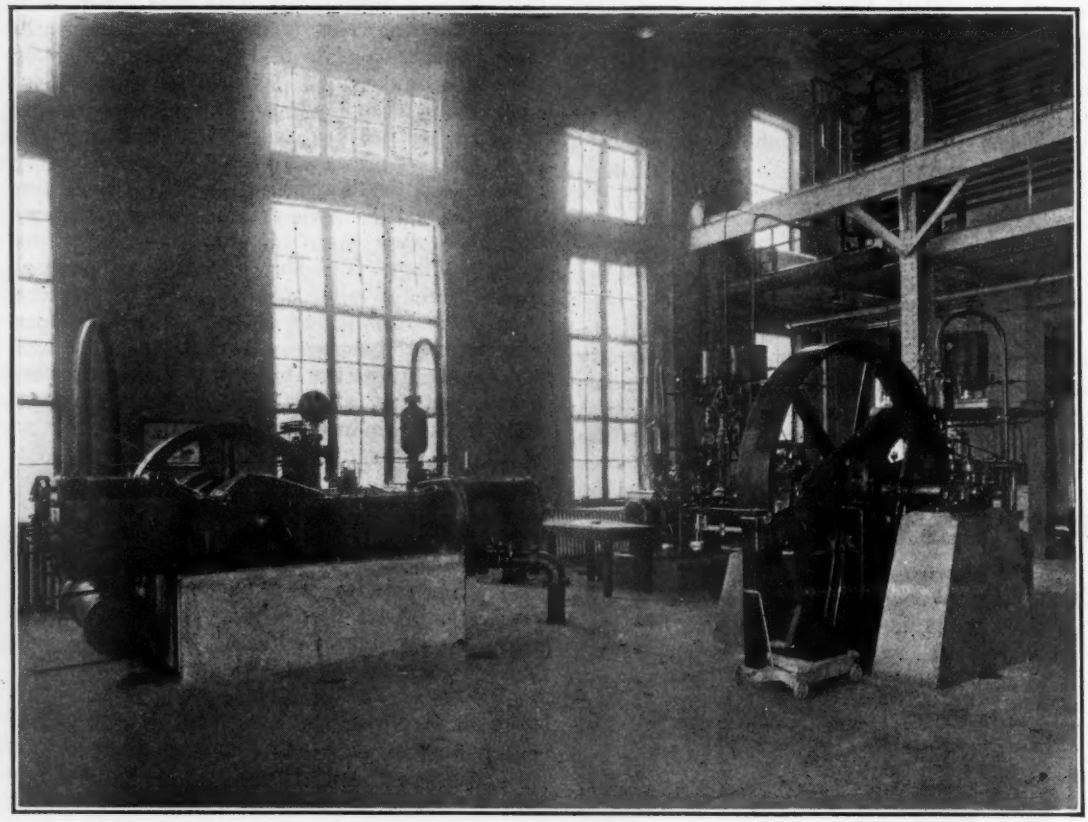


Photo by Alfred Waldeck, Baltimore, by courtesy of Johns Hopkins University.

IMPERIAL TYPE X P V INGERSOLL-RAND COMPRESSOR, PISTON VALVE STEAM ENGINE DRIVEN. INSTALLATION AT JOHNS HOPKINS UNIVERSITY.

THE ABOVE picture, provided through Professor J. C. Smallwood of the Department of Engineering, Johns Hopkins University, shows an installation of an Ingersoll-Rand Imperial Type XPV, piston-valve, steam-driven air compressor, which is used for the benefit of students at the University. The compressor is 9x18 steam, 16x10 air and 14" stroke, and is fully equipped, Professor Smallwood writes, for measuring the steam consumption and other items of performance. It has eight indicator cocks and when undergoing test eight indicators are used.

The air is discharged into a receiver on the floor below, from which it emerges through an orifice, by which means the quantity of air is measured. The receiver is large enough to maintain a practically constant pressure behind the orifice. Professor Smallwood says:

"It was the original intention to test a number of orifices under high pressures with a view to the determining of the coefficients, the standard of measurement being the Thomas airmeter which is perhaps the most accurate instrument of its kind. The war, however, interrupted this line of research, as well as a number of similar lines on this unit. It is likely in the near future some additional compressed air machinery will be installed, which will be supplied by this compressor and will be fitted with special testing apparatus."

J. D. Haydon, roadmaster of the Louisville & Nashville R. R., with headquarters at Louisville, Ky., has been appointed superintendent of the Atlanta division, with headquarters at Etowah, Tenn., succeeding A. P. Bayless, resigned.

CONSTANT VOLUME AIR REGULATOR FOR TURBO-BLOWER

Brower, Boveri & Company, London, have lately put on the market an automatic regulator for turbo-blowers the special features claimed for which are that it can be used with all pressures, that it is entirely enclosed, is perfectly stable and is not subject to wear. It influences directly the oil pressure under the piston controlling the steam regulating valve of the driving turbine, and hence the speed of the turbo-blower.

The cut here reproduced from *Iron and Coal Trades Review* shows diagramatically the regulator as applied to a Brower-Boveri steam turbine. In a turbine of this design the governor operates through the sleeve F (directly connected to the link gear of governor C), increasing or decreasing the opening of the outlet port in the governor oil system, and thus the oil pressure varies under the piston connected to the main turbine throttle valve, whose opening is proportional to the oil pressure. A rapid pulsation in the oil pressure, in order to increase the sensitiveness of the whole governing gear, is obtained through the beveling of sleeve F., shown in the figure.

The arrangement of the automatic air regulator is as follows: On the regulator spindle there is fixed a diaphragm piston E (supported by the spring G), which divides the casing surrounding it into two compartments. These are connected by means of the pipes 4 and 5 in which resultant pressures are obtained by means of the diaphragm in the air main, the difference between them depending directly upon the quantity of air delivered. The resultant pressure acting upon the diaphragm E causes a movement which is directly transmitted to the plunger of the oil relay L, which is a part of the oil-governing gear of the turbine *via* the pipes 1 and 2, so that the pressure of the oil in the governing system of the turbine depends upon the amount of the displacement of the diaphragm E.

The operation of the regulator is as follows: Should an increase occur in the volume of air delivered, there will result an increased pressure above the diaphragm E, and the resulting movement communicates itself (against the resistance of spring G) to the plunger or relay L, thus increasing the area of the oil-outlet passage and allowing more oil to pass. The oil pressure consequently diminishes, and the throttle valve of the turbine will close by an amount which corresponds to the difference in pressure across diaphragm E, and the turbine speed will be reduced until the original volume of air is restored. Conversely, when there is a reduction in the air volume delivered by the blower the process will be reversed.

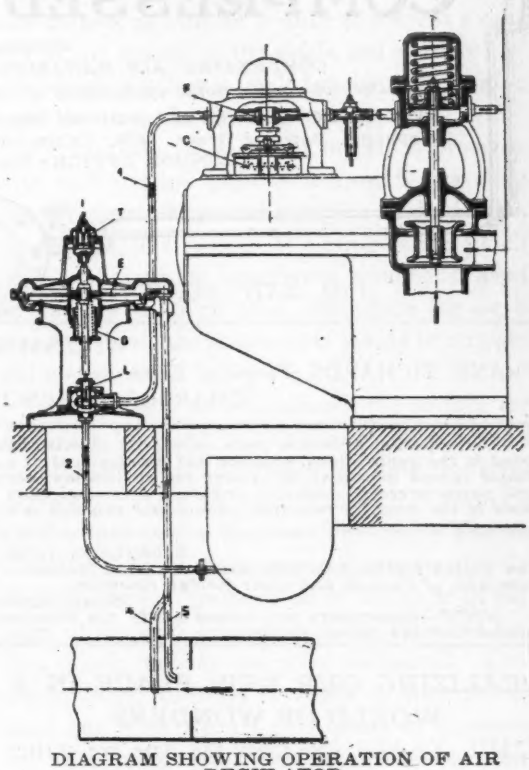


DIAGRAM SHOWING OPERATION OF AIR REGULATOR.

HIGH COST OF AIR LEAKAGE ON RAILROAD TRAINS

It is not easy to realize the volume of air lost by leakage in long railroad trains when running. It may be said that less than one or two per cent. of the air compressed is used for the brakes while all the rest is lost. On long runs of freight trains the brakes may be operated only three or four times in ten hours, while the leakage never stops. A report of the Master Car Builders' Association states:

"A 100-car train requires 180 cu. ft. of air, and with a four pound per minute leakage (which is not unusual), the compressor has to pump 84 cu. ft. per min. additional. This is equal to 2.880 cu. ft. per hour, which requires 82 pounds of coal per hour and using 574 pounds of water. A leakage of five or six pounds per min, is not uncommon, and a conservative estimate of coal consumed is 860 to 1,720 pounds for 10 hours. On many trains the leakage in five minutes is equal to the air necessary to make a full service application."

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W. L. SAUNDERS, *Editor*

FRANK RICHARDS, *Technical Editor* FRANCIS JUDSON TIETSORT, *Managing Editor*

CHARLES A. HIRSCHBERG, *Business Manager*

Correspondence invited from engineers, chemists, experimenters, inventors, contractors and all others interested in the applications, practice and development of compressed air. Correspondents and contributors will please submit questions, or matter for publication, accompanied by self-addressed stamped envelope; they also will please preserve copies of drawings or manuscripts as we cannot guarantee to return unavailable contributions in the event of rejection, though our practice is to exercise diligence in doing so.

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REALIZING OUR NEW PLACE IN A WORLD OF WONDERS

FIVE YEARS ago from the date we write, July 28th, the greatest war of all history began. It brought events and results in its train that the wildest dreamer could not have forecasted. The commonest affairs of life are changed as a result of the war. In change of conditions the gap that divides 1919 from 1914 is as great as the gap that divides the twentieth century from the eighteenth. The person who looks for a return of the conditions of 1914 in any readjustment of business or social affairs has been unable to read the signs of the times.

Those who have not awakened to the new order have been constantly reminded this summer by the National Prosperity League of some of the startling things five short years have witnessed.

Machines loaded with men and cargoes fly through the air for long distances at a rate of one hundred miles an hour. Ships of war can travel under the seas at speeds that rival the fastest sailing vessels of a century ago. Men on the surface of the earth talk through wireless telephones to men flying a mile high in the air. A speaker in Washington addresses a great street throng in New York City and his every word is distinctly heard by telephonic amplifiers of sound.

Great tonnage of freight is moved by trucks over open roads for greater distances and at higher speeds than were achieved by our railroads a few decades ago. Giant ocean steamships are to be built to force their way through the water faster than the average railroad train or touring automobile travels. Ships that required years for construction are now built in a few months—one cargo carrier was built in less than thirty days. Time of production for all commodities has been cut repeatedly. Processes of manufacture have been revolutionized.

America has passed from a debtor nation, owing billions, to a creditor nation, lending billions. Thirty thousand security holders in America have expanded into thirty million.

What were regarded as impossibilities only sixty months ago are now commonplace realties. Financially, commercially, socially, the world has been turned upside down. Preconceived notions and prejudices have gone into the discard. Things that would have been first page news sensations in the newspapers five years ago are now dismissed with a paragraph.

We are truly living in a new world, and in the

main a much better world, thanks to the sacrifices of those who laid down their lives for freedom and justice in international intercourse. The past and its conditions have gone, never to return. We are living in a new era and it is time we all realized it.

Prices for everything we buy are higher and so are incomes and earnings. America never earned so much before and never had so much in its stocking. The best evidence is that the excess of exports over imports for the fiscal year of 1919 was $4,129,000,000 as against less than $500,000 in 1914.

The moral is, that if we have something to sell, let us go ahead and sell it; if we need something, let us go ahead and purchase it. We shall not be able to buy or sell at price levels of half a decade ago. We must stop conjecturing about the new order, and must accustom ourselves to the present and go ahead and do business.

Therefore, once more, let's go!

AIR ENTANGLEMENTS IN MINE VENTILATION

THE SUGGESTIVE editorial, which we here reproduce from *Coal Age,* originally appeared under the title: "A Bottle with Two Necks," which did not seem to us very satisfactory. We confess, however, that the title which we use here does not suit us much better.

At no part of the mine does the air travel so fast as in the mine entrance and the main return, whether that entrance or return be a drift mouth, slope or shaft. It is these two points, therefore, that quite largely influence the resistance of the mine to the ventilating current. Further underground the air is split into multitude of more slowly moving currents, and the friction is accordingly reduced.

The amount of air to be delivered is not allowed in many cases to determine, as it should, the size of the intake and return. This is largely fixed by a consideration of the use of these passages for transit. We seem to imagine that the air will force its way through these orifices if only a fair way is provided beyond.

In the passageways leading to the fan especially, there are often sharp angles. Where the flows from well separated districts return into a common current no attempt is made to prevent a conflict at the mouth of the single and narrow airway which, vastly too small for the service, must carry the air to the fan.

We overlook the fact that the air is provided with such narrow quarters it must be traveling fast and should be guided gently to its destination by well-shaped airways. We can give the air all kinds of harrowing experiences where the speed of travel is relatively slow, but where the air is moving rapidly the stream lines should be straight and undisturbed.

Unfortunately as we approach the surface the roof gets bad, and the exigencies of continued maintenance demand a more carefully protected roadway. Hence we tend to make the roadways narrow and fortify them with timber. The air eddies around in these narrow passages, and the friction is much greater than it would be in passages of the same size and carrying the same current if only the eddying were eliminated. Concreting such roadways by forms or with the cement gun is therefore a good means of increasing the ventilating capacity of the airway and hence of the whole mine; and it serves to prevent the airway, not to speak of the roadway, being blocked by ice in the winter.

It is perhaps unfortunate that we cannot see the air and so realize visually what a waste of energy there is when a ventilating current is churned up by a line of timber-set riffles. But what we do not see and know may hurt us most severely, and it is necessary for us to realize that we will not get efficient ventilation if we trip our air as it enters the mine by a lot of crossbars, legs and laggings and trap it as it leaves the workings by a series of similar resistances. A concreted shaft is not only safe and durable, it is a money saver in ventilation. No piping or cabling which goes lengthwise of the tunnel or shaft resists the air like the transverse timbering by which these airways are quite usually kept open.

In a recent issue we presented a sketch of Mr. BRUNO V. NORDBERG, for the facts contained in which we were indebted to our contemporary, *Power Plant Engineering,* a courteous recognition of which obligation we inadvertently neglected to make apparent at the time.

Our attention having been directed to the matter, we very glady make amends, and acknowledge with full credit the source of information which thousands of COMPRESSED AIR MAGAZINE readers found of interest. Mr. NORDBERG'S career in the field of compressed air has been a long and honorable one, as this publication has frequently had occasion to note, and we would be delinquent in a sense of appreciation if we revealed ourselves as insensible to an understanding by other publications of what his influence has been in his years of usefulness.

LIQUID AIR FOR PERPETUAL MOTION—SURE, IT'S EASY

IT WAS, as we remember it, the *Scientific American* that once assured its readers that if ever a pseudo-inventor come along with an utterly impracticable mechanical invention it was sure to have a toggle-joint among its various contraptions. According to our observation and experience liquid air is now taking the place of the toggle-joint, and it is made to promise to do still greater wonders.

We print herewith a bit of very readable narrative from *The Gas Engine* showing how one inventor was proposing to exploit liquid air. It is impossible to read it without some lingering traces of incredulity! For instance, we have many doubts—which means that we have none at all—about liquid air having been made with a bicycle pump!

The Government Engineer sat at his desk carefully checking a column of figures. The intensity of his concentration cut him off from his surroundings as completely as if he were enclosed in armor plate. "All that stuff will be junk six months from now," spoke a voice at his elbow.

The engineer came back to earth with a snap. "Were you speaking to me?" he asked, as he pushed his spectacles up on his forehead and turned to the speaker.

"That's gasoline in those bottles there, isn't it?" the voice replied.

"Yes, gasoline and samples of other hydrocarbons," the other replied.

"That's all going to be junk in six months."

"Indeed?" and the scientist raised his eyebrows to accentuate the interrogation.

"Just so soon as I get my invention in working order," the visitor put forth.

"Rather hard on the oil companies," the engineer suggested, repressing a smile.

"I should worry about the oil companies. You see all I need to do is to get a little liquid air and use this to run an engine, and the engine turns the liquid into the tank and I use it over again. All I need for a starter is just a bicycle pump. I can make enough liquid air by hand with a bicycle pump to start the engine going. Then all I need is just the engine. Just think how fine it is. You can run your automobile with my liquid air engine until you are ready to stop, and you won't need any gasoline at all. And think of the motor boats and the ships and the airplanes. Don't you see that an airplane can fly around the world if it wants to without coming down, for it won't have to carry any gasoline and the engine will keep right on running until you stop it."

"You're not an engineer?" the other asked.

"No, I'm a lawyer, but some of the greatest inventions were made by men without being scientists and I actually have made liquid air with a common bicycle pump."

"Almost perpetual motion isn't it?" suggested the man at the desk.

"Not exactly, but the next thing to it. But the energy comes from the liquid air and not from nothing," the lawyer exclaimed.

"Fine business," agreed the engineer. "What becomes of the energy used to drive your automobile or your airplane.

"Oh, that goes right back into the liquid air, and its done automatically too. You see my scheme is to attach a pump to the engine and this pumps the liquid air right back into the tank."

"Quite a scheme," the man at the desk agreed.

"Yes," was the enthusiastic rejoinder "and just think of it, the Standard Oil Company and all its competitors will have to make something else besides gasoline or else go out of business when I get my engines going. It won't be long now. I have the capital all ready and all I need is the approval of the Government. That's what I am here for today."

"Did you ever hear of the principle known as the 'conservation of energy?'"

"No, not exactly."

"Do you know that it is proved beyond a shadow of a doubt that there is just so much energy in the universe and that you cannot increase or decrease it?"

"But what's that got to do with my scheme?"

"Your plan involves the increase of the total of energy."

"No sir, not at all. I get my energy out of the air where it is free to everybody and I don't increase it at all."

"What becomes of the energy you use to drive the engine and the engine gives out to drive the automobile?"

"Oh, I get that back out of the air by the pump on the engine."

"Well my friend you certainly have some scheme."

"You approve of it then?"

"No, not altogether, but I think it might be worth your while to try it out. It certainly would be an education for you in the principles underlying science."

"Don't you think I will get the Government to back it up?"

"The government is very peculiar in its attitude towards new inventions. The war is over and Uncle Sam is like the gentleman from Missouri, just now."

"Oh, I'll show them alright, just watch me. Here is my card. In six months the name on that card will be known throughout all the land as a benefactor to mankind."

"Will you premit me to make a suggestion?" the engineer asked the artist in liquid air.

"Certainly."

"Before you spend any money on this, read a book on elementary physics, then another on the principles of engines including chiefly those operated by compressed air and you will save yourself a lot of time and money you would otherwise spend in experimentation."

"Thanks, I'll do that. May I ask your name."

"My name is of no consequence," the other explained, "I am simply one of the cogs in the Government machine. However, I read the papers and if anything comes up I will certainly hear of it."

"You will, and before long too, good bye."

"Goodbye and the best of luck," and the visitor was gone.

As the door closed the engineer picked up his card. It bore the inscription Nelson Ulrich Thompson.

"N-U-T, Nut. My friend you were rightly named," the man at the desk remarked as he picked up his slide rule and resumed his computations.

MOTION PICTURES AS A MEANS OF FOREIGN ADVERTISING

AMERICAN manufacturers whose lines are sold widely in foreign markets have of late years been turning their attention to the moving picture as a possible means of developing larger sales and of stimulating a general sense of appreciation in overseas countries of American industrial products. Thus far too little has actually been accomplished. A score or more of large United States corporations have utilized the cinema for publicity purposes, but mainly at home. Four corporations that come quickly to mind in this connection are the Ford Motor Company, the General Electric Company, the Ingersoll-Rand Company, and the Niles-Bement-Pond Company. These concerns have spent many thousands of dollars on moving picture adjuncts to broad-gauge advertising.

One of the best known American producers in the moving picture field, D. W. GRIFFITH, who has done some really artistic things and who is regarded as an authority on the possibilities of the screen, is firmly of the belief that the motion picture will "Americanize the world." Its influence, at any rate he declares, is gradually spreading, and this unconscious and subconscious propaganda is exciting the admiration of other nations.

Mr. GRIFFITH classes the cinema as an art, and "the only truly American art that is seen and understood by every race on earth." The word "art" is so catholic a term, that it will get us nowhere, in considering the advantages to be derived from the commercial and educational application of the moving picture, to argue with Mr. GRIFFITH regarding the accuracy of his "art" characterization. We may safely grant, in passing, that some cinema productions are actually artistic—others, heaven and earth both proclaim, are deplorably lacking in art qualities.

The American field of industry may profitably consider, however, Mr. GRIFFITH's expressions on the publicity side of the subject. He assures us that even the half civilized tribes in South Africa are now attending American picture shows. He has reports indicating that one picture is being exhibited simultaneously in Tokio, Rome, Paris, London and in South Africa, while being exhibited in the United States.

He regards, with deep conviction, the motion picture as the most comprehensive and most powerful force for propaganda work that the American nation possesses, because of the popular estimate of screen productions in other lands. In foreign countries the cinema picture is considered an art production, on a par (as an influence) with their plays, their paintings, their music and literature. Foreigners endeavor to understand and appreciate the motion picture as they do "other forms of art." It is being used, although without any art aim, in depicting American ideals before the world.

We feel like interjecting into Mr. GRIFFITH's discussion of the subject a suggestion to the effect that the United States Government should exercise some sort of censorship over films that are exported, judging by the effects upon Americans, at least, of some of the scores of films which we have seen displayed in foreign countries. Only fear of international complications at times has restrained intelligent and patriotic Americans abroad from breaking up cinema exhibitions where anything but American *ideals* were depicted, and which gave the foreigner an entirely erroneous idea of American life.

There is truth, of course, in the main in Mr. GRIFFITH's statement that abroad they see the American man on the screen as a graceful athlete, a great financier, or as some kind of genius. Always in heroic pose! It is the same with

American womanhood. She is represented as the highest type on earth in these pictures that go round the world.

Naturally the average scene is made in America. Our costumes or methods of business and our mode of living are presented all over the world every day. England and France, realizing this, have taken steps through their respective governments to acquire motion picture plants modelled on the American style. They have employed American directors and actors to turn out domestic films about those countries. This was done of course to offset the American influence on foreign trade.

Even German agents have been negotiating through agents here ever since the armistice was signed for the larger and better known American pictures with a view to showing them in Berlin. The audiences, tired of war, now want to devote spare time to other things, and the German theatrical men have been willing to pay any price within reason, cash down, for any length of contract, if they could have the pictures in Berlin. Such offers were rejected, according to Mr. GRIFFITH.

Our motion pictures figured in every Government department during the war. In fact they were the most satisfactory source of information concerning conditions on the battlefield —actual conditions, that is.

The film is being used at present in business, but it should develop into a larger field and with a far greater range of activity. Our big business men cannot afford to ignore the signs of the times, the great commercial struggle impending. If they do what Mr. GRIFFITH thinks they intend to do, they will take the American motion picture right into both their old and new territories and stimulate an interest in America and all things American.

"It's a strange fact but true," the picture impesario observes, "that in this country we are specialists, and we confine ourselves to our particular field. In Europe things are different. There an intelligent person familiarizes himself with the art of his time.

"Where in our country will you find business men or politicians preferring to dine with artists, writers or actors rather than with their own kind? It isn't done, that's all, except in rare instances such as dinners and other gatherings of a more or less public nature.

"The great empire builders of England, men like Winston Churchill, for example, are as good judges of acting as any dramatic critic in America. Why? Because they have studied it. Churchill studied scenario writing, not because he intended to write scenarios, but he wished to understand the motion picture. And Churchill, as can all of his colleagues, converses familiarly on almost any topic, the subject depending on the inclination of the other person. Churchill knows that the motion picture is the most effective propaganda for empire building today.

"Our books are not widely read in the world. Our music is not heard far from the seat of the English and American tongues. Our paintings are hung in our own galleries and studios. The reason for the supremacy of the cinema is its medium. It requires only one sense—sight. We all possess the same sight. We can interpret almost all of that which we can see. We believe at least half of it. It matters not to the African native or the Hindu, the French peasant or the Lithuanian, that he knows only his own language. He can read the pictures, and he is thinking American while thinking of what he has witnessed."

There is a deal of sound sense and truth in these views. The American manufacturer of machinery; particularly of that kind of machinery that is strikingly interesting in action, will be overlooking a great opportunity if he neglects the moving picture as a foreign advertising medium. There is a limit to what writers, illustrators and scientists can accomplish with their workaday tools and mediums in converting the world to a point of view. The moving picture affords a powerful support for their efforts in industrial, social and financial penetration.

Nearer approaches to mechanical perfections in the industries are bound to have sociological effects. Good machinery makes for high production and high wages, which are means to peace and contentment for capital and labor.

There are hopes ahead of thus far unguessed mechanical wonders that will help to stabilize the world. We need not give way to pessimism nor become infected with the black glooms of nations less favored. The world may have hopes of America, for we have hopes of ourselves.

Out of the free air may some day be snatched power elements now unharnessed. We may hope for a good deal yet from the internal combustion engine, and who knows, it may some fine day take the place of the steam engine, though that possibility now appears far off. A new fuel may come along, such as the "alcogas" by which the Navy is reported to have produced ten per cent. more power than with gasoline.

The New York Times published a cable dispatch not long since telling of the invention of the Still engine, which runs by gas explosions on one side the piston and by steam power produced by the explosions on the other side the piston, with a gain over the Diesel engine of ten per cent. or more in power and economy in fuel of half. Such an engine might prove too heavy for aviation work, and yet nobody can foretell the weight limit of air machines.

Between 1908 and 1913 sixty per cent. of air casualties were due to mechanical collapses, but since then only two per cent., and the air machine is still a baby.

It seems a poor substitute for the locomotive, and yet who foresaw the locomotive's possibilities or its limitations? The rail made the locomotive an all-year worker, and gave the railway a permanent precedence over either the canal or the dirt roads.

The air-filled tire divorces the automobile from the rail and gives it a universal use which the locomotive can never have. The air machine is as free as the bird, and nobody can say where it may not go in another century.

It has been most interesting to note the editorial expressions called forth by Mr. VANDERLIP'S words of warning, and encouraging that they bring a reaction of optimism. As *The Times* remarked, "there is no more reason why pessimism should monopolize all the attention than why the devil should have all the good tunes."

There is even better reason for fancying that pessimism has exhausted invention than that optimism has.

There is a very great capacity in what will follow labor's impending discovery that capitalism supplies tools which men merely assist, driving the tool and saving the energy expended when the total was driven by human muscle. This is what explains our world, the existence of factories, the maintenance of social life in cities, while machines produce food in abundance beyond the power of the man with the hoe.

Just as the spinning mule displaced the distaff in the eighteenth century and the steamship the sailing vessel in the nineteenth, so in the twentieth there will be more gains in efficiency. Anyway, the world has hopes of something, and as long as there is hope there are life and growth and better days ahead.

THE ROOSEVELT MEMORIAL ASSOCIATION

THE ROOSEVELT Memorial Association has been formed to provide memorials in accordance with the plans of the National Committee, which will include the erection of a suitable and adequate monumental memorial in Washington; and acquiring, development and maintenance of a park in the town of Oyster Bay which may ultimately, perhaps, include Sagamore Hill, to be preserved like Mount Vernon and Mr. LINCOLN'S home at Springfield, Ills.

In order to carry this program to success, the Association will need a minimum of $10,000,000, and so that participation in the creation of this memorial fund may be general, it asks for subscriptions thereto from millions of individuals.

Unselfish and sincere in purpose, unswerving in seeking the right and following it, definite and direct in action, with his theory of personal responsibility for wrong-doing and his creed of "the square deal" for all, Col. ROOSEVELT gave a lifetime of devoted public service which must stand as an inspiration to the youth of this land for all time. Ardently American, believing profoundly that only through fullest acceptance of America's privileges and responsibilities could the people of this country realize their highest well-being and fulfill their obligations to themselves

and to humanity, he set up ideals which citizens of all lands have found not only a duty but a privilege to follow.

His legion admirers feel that a memorial to ROOSEVELT will not so much honor him as honor America and the citizens who raise it to him. A contribution to the ROOSEVELT Memorial will be, in the highest sense, a pledge of devotion to ideal citizenship. Checks may be sent to ALBERT H. WIGGIN, Treasurer, Roosevelt Memorial Association, 1 Madison Avenue, New York City.

SUGGESTION OF A FRIEND FOR A QUESTION BOX

To The Editors of COMPRESSED AIR MAGAZINE:—The writer has received your interesting monthly publication for many years. The magazine covers timely topics in its field and is always replete with interesting facts. Now that you are expanding so energetically and bringing up such discussions as compressed air courses in schools of technology and universities, permit me to make a suggestion that I am confident is a meritorious one.

The compressed air field of today is a large one and each succeeding year finds many new additions in our enormous industrial field. From past experiences I gather that technical knowledge is required solely in the proper selection of the air compressor. The compressor alone would be of no use if there were not air-operated labor-saving devices to operate. Thus, these vital accessories are the stability of the compressor field. I refer, of course, to pneumatic tools, rock and subaqueous drills, sharpeners, air-lifts and kindred tools, used the world over.

The manufacturer has got to be up early and doing incessantly to keep pace with his brother manufacturer, which brings us to the issue of competition. I will state from experience that these air-operated accessories are in most instances selected and purchased by men who are not interested in the technical points of superiority, but solely in the ability of the tool to save time and money and show savings over hand work or over tools offered by other makers. If it is all that is claimed for it, it sticks on the job, repeat orders follow and the manufacturer is rewarded with large business.

Furthermore, your magazine is appreciated most by the superintendent who is constantly looking for the latest in compressed air tools and other equipment. He and his subordinates have many hard problems to solve. Sometimes a riveter, rock drill or an air lift is condemned because the operator is confronted with a problem he cannot solve.

This brings us to the suggestion I have in mind, and that is, that you allot a certain space each month to a "Questions and Answers Department." I believe this would help many a superintendent and engineer that is condemning a good piece of compressed air equipment. I have been of this opinion for a long time and believe that your inauguration of such a department would meet with an appreciative response.

In common with other readers and well-wishers of COMPRESSED AIR MAGAZINE, I hope that you will give this matter serious and favorable consideration.

E. F. BOYLE.

San Antonio, Texas,
Postoffice Box 893,
July 26, 1919.

We have had in view for some time the re-establishment of such a department, which was formerly conducted in these columns, and we are appreciative of Mr. Boyle's suggestion. The object of COMPRESSED AIR MAGAZINE is to disseminate useful information. It sincerely desires to be of real assistance to its readers. We have decided to act at once, therefore, on the suggestion of our correspondent, and are glad to announce that we shall be pleased to answer to the best of our ability all questions forwarded to us, provided they are put clearly and explicitly and that all of the circumstances surrounding a given case are given as a working basis for an intelligent reply. Both question and answer will be published for the benefit of all readers, some of whom may have parallel problems. We cannot undertake to make private replies by mail.—THE EDITORS.

The article by Frank Richards, "The Air Receiver," published in COMPRESSED AIR MAGAZINE for August, appeared originally, and practically simultaneously, in *The Engineer,* London, and *Power Plant Engineering,* Chicago, of which fact we omitted to make a publication note at the time. The article attracted widespread attention among compressed air engineers both here and abroad.

Personal Intelligence

Samuel Thomas Wellman, inventor, manufacturer and engineer of Cleveland, Ohio, is dead at seventy-two after a half century of identification with the improvement of equipment used in the making of steel. He introduced the electric charging machine and the handling of materials by the electric magnet, which devices are now in widespread use throughout the world. His genius lowered the price of steel, shortened labor in its manfacture and saved millions of dollars to the industrial world. He was an expert who was constantly eager to learn more about steel making. About two years ago he is said to have remarked: "It is fifty years since I left my home in the hills of New Hampshire and started for Pittsburgh to get my first insight into the steel business. I have been trying to learn all about it ever since, but what I don't know would still fill a big book." He was a member of many engineering and scientific societies. He left two daughters and three sons.

At the commencement of the University of Pittsburgh, the honorary degree of Doctor of Engineering was conferred upon Vannoy H. Manning, of Washington, D. C., the Director of the Bureau of Mines, Department of the Interior. Dr. Raymond F. Bacon, Director of the Mellon Institute, said in his presentation address: "This distinction is most appropriately conferred upon Mr. Manning in recognition of his leadership of all work on the conservation of our natural resources. Possessing the highest executive ability, an authority on mineral technology, Mr. Manning has rendered inestimably valuable service to the nation in the development of the activities of our world-famed Bureau of Mines and in demonstrating to our industrialists and legislators that research is the basis of national development."

* * * *

We regret to record the death of Frederick Sargeant, senior partner in the engineering firm of Sargent & Lundy, Chicago, who passed away on July 26 at his home in Glencoe, Ills., as the result of an illness which began while he was in England last spring. He was born in England in 1859. He obtained his early mechanical and engineering training in Scotland and set forth for the United States in 1880. After varied experiences in the Middle West he became consulting engineer of the Chicago Edison Co. in 1887 and remained in that capacity for the company and its successors, the Commonwealth Edison Co. to the time of his demise. Lack of space prevents our detailing his many achievements. He was known for his notable work as consulting electrical engineer for the World's Columbian Exposition at Chicago, by which he was honored with a medal. His work was by no means confined to Chicago, for he was consultant for scores of power and light corporations throughout the country, designing machinery layouts for many plants. He was a member of many clubs and left a widow, a daughter and two sons.

* * * *

The Chicago Pneumatic Tool Company has appointed L. C. Sprague, formerly district manager of sales at New York as manager of western railroad sales with headquarters in the Fisher building, Chicago, and H. G. Barbee as manager of eastern railroad sales with headquarters at 52 Vanderbilt Ave., New York City. Nelson B. Gatch, formerly district manager of sales at Chicago, has been appointed district manager of sales at New York, succeeding Mr. Sprague. The company also has appointed R. S. Thulin as special railroad representative on the staff of Mr. Sprague. The company's Minneapolis office has been moved from the Metropolitan Bank Building to Fifth Avenue and Fifth Street South. J. L. Canby has been made district manager of sales at Chicago.

* * * *

Major Hugo Diemer, lately of the Ordnance Department, U. S. A., has become superintendent of personnel for the Winchester Arms and Manufacturing Co., New Haven, Conn., resigning his chair of industrial engineering at the Pennsylvania State College.

* * * *

Their nominations having been confirmed by the Senate, Judge John Barton Payne, Henry M. Robinson, and Commander Thomas A. Scott, whom the President had nominated as Commissioners of the United States Shipping Board, assumed office August 14 and attended the regular meeting of the Board. The Board now has a full membership, consisting of Judge Payne, elected chairman; Raymond B. Stevens, vice chairman; and Commissioners John A. Donald, Henry M. Robinson, and Thomas A. Scott.

* * * *

William P. Donovan, general superintendent of the Gasolene Department of the Gpysy Oil Company, Tulsa, Okla., is dead at the age of 44 in Philadelphia. He was born in Eagle Rock, Pa.,where he was educated in the local schools. He entered the oil business in 1892 with the Crescent Pipe Line Co. and assisted in the construction of a pipe line from Oakdale to Marcus Hook, Pa. In 1902 Mr. Donovan became superintendent of distribution of the Gulf Refining Co. at Bayonne, N. J. He went with an affiliated concern, the Gypsy, in 1913, and he designed and constructed plants in Louisiana, Oklahoma, Texas and Mexico for the production of gasoline from casinghead gas.

* * * *

Morris Knowles has returned to Pittsburgh, having ended his engagement as chief engineer of the housing department of the Emergency Fleet Corporation.

* * * *

H. H. Esselstyn, Commissioner of Public works of the City of Detroit, resigned to resume his activities with the firm of Esselstyn, Murphy & Hanford of that city, architects and engineers, his giving up public duties having been the result of the extended business of the company.

* * * *

George B. Allen, Texas representative of the Yarnall-Waring Company, Philadelphia, who has been located at 305 Southern Pacific Building, Houston, will hereafter make his headquarters in Dallas, for the sale of their well known *Yarway* Fuel Saving Specialties.

CONFIDENTIAL EMPLOYMENT BUREAU

NOTE—Advertisements under either of the classifications below will be numbered in the order of receipt and published free of charge, for the benefit of readers, in the next issue after date. All applications for the use of this convenience should be directed, "Confidential Employment Bureau," Compressed Air Magazine, Bowling Green Building, New York City. Replies to advertisements will be forwarded to the person or persons concerned.

POSITIONS WANTED.

No. 850—Mining engineer, nine years' experience iron open pit and underground, two degrees, Mich. College Mines, copper experience British Columbia and Washington, now foreman large open pit, seeks place as superintendent or assistant. Wants minimum $5,000. Services available this Autumn.

No. 851—Place wanted as expert Leyner Drill Sharpener operator. Long experience in Minnesota iron country and Michigan Copper Range. Steady workman, well recommended. Prefers Colorado.

No. 852—Drill repair man seeks change. If you want a good "doctor" this man declares he can fill requirements. Age 32. Married. Will go anywhere.

No. 853—Mining engineer, Mich., Col. Mines, eight years with Copper Queen, C. & H., etc., wants place on selling force or in advertising for mining machinery house. Salary $250 to start.

HELP WANTED.

No. 426—Experienced miners wanted for Northern Peninsula of Michigan on the Copper Range. Large company and one of best known. Steady, permanent employment for good men under favorable conditions. Write at once to this bureau, giving experience.

No. 427—Young civil engineer wanted by a large contractor in connection with a special engineering job to last about one year. Future connection depends on man. Give experience, references and salary expected. Applications received in strictest confidence.

No. 428—Middle West manufacturer with progressive line and expanding business wishes an able production manager, who must have ginger and ability to handle workmen successfully. Personality will count more than knowledge of manufacturer's line. Write giving full details about history, experience in manufacturing, engineering experience, if any, and what salary would be required.

NOTE—Positions No. 422, August issue, and No. 418, July issue, still unfilled.

Buenos Aires

WIT THAT SPARKLES

True wit is like the brilliant stone,
  Dug from East Indian mine,
Which boasts two various powers in one,
  To cut as well as shine.
Genius, like that, if polished right,
  With the same gifts abounds,
Appears at once both keen and bright,
  And sparkles while it wounds!

Our idea of the height of camouflage, if not of naivete, is a Rolls-Royce radiator and Packard hub cabs on a Henry-Ford, which Nth power exhibit of concealed identification we saw with our very own eyes in Riverside Drive, New York, in front of the Soldiers and Sailors Monument a few days ago.

A southern newspaper comments unkindly to the effect that a New York restaurant has advertised it will open at the historic home of the famous Captain Kidd, in order to carry on business at the old stand.

IT CANNOT BE DONE

"Poets," says Horace, "who expect
  Their verses should for ever live,
Nine years each poem must neglect
  Ere they the final polish give."
This rule might suit the Roman bard;
  But Greenwich Village poets smile
To think, if they their sales retard
  Nine years—how they must live the while!

Uniform Minus Vermiform

Our attention is directed by Bunny, sometime major of engineers in the A. E. F., and a spoofer and bit of wag in his way, to a War Department volume on his desk, which is entitled, "Report by chief of engineers without appendices."

The Usual Way

From the Detroit Free Press.

He worked by day
  And toiled by night,
He gave up play
  And all delight.
Dry books he read
  New things to learn
And forged ahead
  Success to earn.
He plodded on
  With faith and pluck,
And when he won
  Men called it luck.

The Cornish miners, or Cousin Jacks, of the iron and copper countries do everything with dynamite. "Mick" Kelley of Marble, Minn., superintendent of an open pit mine, told us that one Cornishman had a cat, the nine lives of which it was desirable to snuff out, in his estimation. He took the cat outdoors and tied a stick of dynamite to its back, with lighted fuse attached. The cat promptly made nimble tracks for the kitchen and crawled under the stove. The miner reached the kitchen just as it was mounting heavenward and a fragment of stove in passing clipped one of his ears off neatly. When the Cousin Jack is asked how he lost the ear, he replies, "A cat did it."

BAWMIE INTHEBEAN.

AIR MACHINERY EXPORTS

The Bureau of Foreign and Domestic Commerce, Department of Commerce, announces through its statistical division the following exports of air-compressing machinery from the United States to all foreign countries for the month of May, 1919:

Countries	*Dollars*
Belgium	13,376
France	262,514
Spain	3,100
England	333
Canada	11,909
Nicaragua	3,075
Mexico	7,795
Newfoundland and Labrador	79
Cuba	19,054
Haiti	126
Dominican Republic	90
Brazil	21,052
Chile	17,123
Peru	13,585
Uruguay	342
Venezuela	162
China	6,157
British India	12,284
Dutch East Indies	118
Japan	41,766
Australia	1,336
New Zealand	1,940
Philippine Islands	9,274
British South Africa	3,707
French Africa	4,700
Total	$454,997

Books and Writers

LABOR AND RECONSTRUCTION IN EUROPE, by Elisha M. Friedman. Price, $2.50 net. New York: Messrs. E. P. Dutton & Co.

MR. FRIEDMAN, who was formerly the statistician for Messrs. Eugene Meyer & Co., of New York, and who was the editor of "American Problems of Reconstruction," has evolved a highly interesting and valuable book on the reconstruction conditions and problems of the various European countries. The labor problem is admittedly the gravest of the social and economic problems that have come to a climax following the restoration of peace between nations, if that point can be said to have arrived actually. America must have an accurate knowledge of the methods which have been developed in European countries to deal with the problems of labor and of the significance of the labor currents in those countries.

Mr. Friedman's new work is the first attempt to supply that knowledge to American readers. It lays before us the necessary facts concerning the reconstruction commissions which have been formed in practically every country of Europe, neutral as well as belligerent; it sums up the chief problems confronting these commissions and it gives in very full detail the different aspects of the labor problem as it particularly confronts Great Britain and Germany.

The author shows both good taste and discretion in that he advocates no policy and sponsors no scheme. His sole care has been to present the facts, like a good reporter, and whenever possible, quotations are given from the documents published in the different countries, so as to preserve the original point of view.

The book contains an introduction by Mr. William B. Wilson, Secretary of Labor, who observes that the great value of Mr. Friedman's effort is that it brings together, in consecutive order, a vast amount of useful information at an opportune time, when those who most desire to avail themselves of it would be too busy to assemble it themselves. There is, too, another value, as Mr. Wilson says, and perhaps the greatest of all, in such a book, put forth at a time of storm and stress in the world. "It induces deliberative thought, and this has always been the most potent factor of right reason in the progress of mankind."

The Bureau of Standards, Department of Commerce, Washington, D. C., has issued circular No. 76, setting forth the physical properties of aluminum and its light alloys. The details of the manufacture operations are described, with particulars in regard to temperatures, weights, resistance and other properties. Copies may be had free on application.

The Bureau of Mines, Washington, D. C., has issued a 14-page bulletin presenting the results of its investigations concerning the use of TNT as a blasting explosive. The bulletin, prepared by Charles E. Monroe and Spencer P. Howell, shows how TNT may be safely and efficiently used in industrial blasting operations by those skilled in blasting and corrects many erroneous or misleading statements which have been circulated as to the properties of TNT by giving the results of careful experiments made at the Bureau of Mines Experiment Station.

NELSON'S PERPETUAL LOOSE-LEAF ENCYCLOPAEDIA, An International Work of Reference. Complete in 12 volumes, with 7,000 illustrations, colored plates, colored maps and engravings. John H. Finley, LL.D., editor-in-chief, Commissioner of Education and President of the University of the State of New York. New York: Thomas Nelson & Sons.

WE HAVE received from the publishers some interesting specimen pages showing recent additions to Nelson's Loose-Leaf Encyclo-

paedia, which are illustrative of how this standard reference work is kept constantly up to date. As Dr. Schurman of Cornell says, ordinary encyclopaedias speedily become obsolete. Works that are revised once in a decade are often twenty and thirty years behind the times on certain subjects, as we have had occasion to note with vexation in the case of one celebrated work we bought last year for personal use at a cost of more than one hundred dollars.

The publishers of Nelson's assert for it that it is virtually made anew every six months, but that in reality the process of keeping the loose-leaf encyclopaedia up to date is practically continuous. In March and October of each year subscribers receive 250 or more new or revised pages. Some 3,000 or more changes are made a year to keep pace with the never-halting progress of the world's development. The accuracy and dependability of the work is therefore obvious.

We note that this encyclopaedia keeps particularly well abreast of the times on American industrial and scientific subjects and for this reason, if for no other, are glad to commend it to our readers in the engineering profession and throughout the manufacturing industries.

The Westinghouse Electric & Manufacturing Company, East Pittsburgh, Penn., has issued a complete catalogue in which all of its electrical supplies are listed. The volume contains 1264 pages of descriptive matter pertaining to the products of the company, some twenty pages comprise a complete cross index and index to style numbers and a table of "Approximate Cost Multipliers." Although the book is a catalog it contains much information of a technical and engineering nature. It is planned to make its issue annually, and it is believed to be the first volume of this kind published by an electrical firm having such a wide diversified product as the Westinghouse Company.

The Babcock & Wilcox Company, New York City, is distributing a treatise written by Mr. Arthur D. Pratt, entitled "Principles of Combustion in the Steam Boiler Furnace." There are 112 pages 6 by 9 inches in size; the volume is indexed and cloth bound. The viewpoint from which it has been written is that the efficient generation of steam in the boiler proper becomes in reality a question of efficient combustion, for most types of apparatus used for steam or for power generation have reached a high state of development. Therefore, the matter in the book is aimed at this phase of boiler practice. The titles of the chapters or sections into which the book is divided are: The Chemistry of Combustion; Density Weight and Volume of Gases; Heat of Combustion; Specific Heat; Temperatures Developed in Combustion; Air and Combustion; Combustion Formulae; Combustion Losses; Smoke; General Conclusions; The Computation of Combustion Data; Heat Balance.

The Wheeler Condenser and Engineering Company, Carteret, N. J., has issued preliminary bulletin No. 113, illustrating and describing the Wheeler steam jet air pump. Its pages explain the operating principles, give reasons for the efficiency obtained, minutely describe the intercondenser, and show a set of operating test curves. There is also included a cross-sectional drawing showing how to connect double or triple machines to condensers.

UP-TO-DATE AIR-BRAKE CATECHISM, by Robert H. Blackall. Revised, and illustrated by detail engravings and colored plates, including 2,500 questions with their answers. Price, $2.50 net. New York: The Norman W. Henley Publishing Co.

AIR-BRAKE practice has undergone many changes in the last decade, what with longer trains, cars of heavier capacity and locomotives of greater power and weight. In the revision of the Blackall book to bring it up to present conditions, the observation is made that the original air brake was designed with the idea in mind that maximum length of trains would be fifty cars, each of a capacity of 60,000 pounds. A large percentage of cars today have a capacity of 100,000 pounds, the number of cars in a train is often 100, and the hauling power of the locomotive has kept pace. Passenger cars and engines have also doubled in weight. The result of these changes has been that much apparatus in use for many years is not adequate to handle, with the desired efficiency, the long and heavy trains of today.

As a result of the heavier equipment and increased traffic, the Westinghouse Air Brake Company has developed new engine and car equipment by the use of which even better results are obtained with the long and heavy trains than could be obtained with the older equipment and shorter trains. Passenger trains are stopped in about the same distance as was accomplished with the older form of highspeed brake and the lighter equipment in general use during the previous ten years.

The Blackall "Catechism" comprises examination questions for engineers and firemen and all other railroad men preparing to pass an examination on the subject of air brakes. The book, in its various editions, has been endorsed for its practical value by air-brake instructors and examiners on nearly every railroad in this country. It is one of a series of the Henley practical railroad books that are well nigh biblical in their value to workers of the rail.

MODERN MACHINE SHOP CONSTRUCTION, EQUIPMENT AND MANAGEMENT, by Oscar E. Perrigo. Price, $5 net. New York: Norman W. Henley Publishing Co.

OUR FIRST viewing of this work has well repaid us and filled us with admiration for Mr. Perrigo's comprehensive survey of his subject. Administrative officers will find this book of peculiar value, as well as of ready interest. The title tells the ground covered by the author, who is a member of the American Society of Mechanical Engineers and a recognized expert in machine shop and factory organization, modern shop methods and time and cost systems.

The book is a comprehensive and practical treatise on economical building and the efficient equipment of shops and their successful management. Factories as well as machine shops are considered by the author, whose views may profitably be considered by architects and engineers as well as by the heads of manufacturing concerns and their various departments.

The author may well take pride in his having enjoyed over twenty years of successful management of shops and factories without having in a single instance encountered "labor troubles," on which many contemporaries will envy him. He believes that much of this smooth-running efficiency has been due to his thorough belief in the intelligent initiative and honest pride of the American mechanic in his work. He is right, for it isn't as a rule the American workman that stirs up the disastrous labor difficulties we have sometimes witnessed, but the imported agitator.

In another revision of this work we hope Mr. Perrigo will devote thought and space to compressed air equipment for machine shops, which would round out to completeness the book's utility.

F. J. T.

HOW TO FIND FACTORY COSTS, by C. Bertrand Thompson. Illustrated with fifty-one charts, seven diagrams and one table. Price, $2.15. A. W. Shaw Company, Chicago, New York, London.

ATTENTION is called in the preface of this work to the fact that less than 20% of business concerns have a cost system, to which deplorable condition is credited, and rightfully so, a large proportion of business failure.

How To Find Factory Costs is written for the manager, the executive and the accountant and is intended to have sufficient breadth to cover industries in general. Initially the book "sells" the reader the idea that a cost system is a necessity in his business and that furthermore a cost system cannot be too good on the same grounds that a business cannot be too profitable.

In successive steps and in quite some detail, aided by excellent charts and diagrams, are taken up the various sub-divisions of cost keeping and accounting and the influence of these important factors upon operations in general and in particular. Direct costs, indirect costs, allowance of interest and depreciation, methods of distribution, the machine-hour rate plan and other fundamentals including the cost of selling, are covered in a manner that should enable the seeker for information to solve some of his knotty problems and perhaps discover new problems to solve.

D. C. G.

PUBLICATIONS RECEIVED

A LECTURE ON ORGANIZATION (reprint) by J. Lee Nicholson of Columbia University. Issued by Messrs. J. Lee Nicholson & Co., accountants and industrial engineers, New York and Chicago. A useful pamphlet designed to assist in the advancement and betterment of American business interests and making for method and efficiency in management. Executives may obtain copies by addressing Messrs. Nicholson at either their New York or their Chicago offices, located respectively in the Woolworth building and the Harris Trust building.

A BUSINESS MAN'S EXPERIENCE WITH INDUSTRIAL TRAINING, by E. A. Barnes, General Electric Co., Fort Wayne, Ind. A message of great value for every manufacturer in America. Issued by the U. S. Department of Labor, U. S. Training Service, C. T. Clayton, Director, as Training Bulletin No. 10. Washington: Government Printing Office.

HOW TO FIND FACTORY COSTS, by C. Bertrand Thompson, Industrial Consultant. Illustrated with fifty-one charts, seven diagrams and one table. Price, $5. Chicago: A. W. Shaw Company. See Review.

LABOR AND RECONSTRUCTION IN EUROPE, by Elisha M. Friedman, Editor, American Problems of Reconstruction. With an introduction by Hon. William B. Wilson, Secretary of Labor. Price, $2.50 net. New York: E. P. Dutton & Company. See review.

TREATMENT OF INDUSTRIAL PROBLEMS BY CONSTRUCTIVE METHODS, issued by the U. S. Department of Labor, Working Conditions Service, Grant Hamilton, Director General. A booklet issued for the purpose of indicating to the business world that efforts to promote industrial health, safety and employment management do not constitute humanitarian idealism and are not merely the

fads of the kind hearted, but represent hard-headed business acumen. The prevention of sickness, accidents and labor disturbances is recognized as good business. The fecilities of the Working Conditions Service are detailed for the benefit of industrial managers who desire to avail themselves of expert research. Sent free on application to the Department of Labor. Washington: Government Printing Office.

PRINCIPLES OF FOREIGN TRADE, by Norbert Savay, A. M., LL.B. An entirely new manuel, covering every aspect of foreign trade. Price, $4 net. New York: Ronald Press Co.

OUR FIRST AIRWAYS, THEIR ORGANIZATION, EQUIPMENT AND FINANCE, by Claude Grahame-White and Harry Harper, with eleven special illustrations by Mr. Geoffrey Watson. Price, $1.50 net. New York: John Lane Company.

THE A-B-C OF AVIATION, by Capt. Victor W. Page, Sig. R. C., A. S., member Society of Automotive Engineers and late chief engineer officer, Signal Corps Aviation School, Hazelhurst Field, Mineola, L. I. Illustrated with drawings and photographs. Price, $2.50 net. New York: The Norman W. Henley Publishing Company.

EFFICIENT RAILWAY OPERATION, by Henry S. Haines. An expert's book by an expert. Containing tables, valuable data and statistics. Price, $4 net. New York: The Macmillan Company.

LUMBER MANUFACTURING ACCOUNTS, by Arthur F. Jones. Second printing. Price, $2 net. New York: The Ronald Press Co.

MODERN MACHINE SHOP CONSTRUCTION, EQUIPMENT AND MANAGEMENT, by Oscar E. Perrigo. Second edition, revised and enlarged. Illustrated with 219 engravings especially made by the author. Price, $5 net. New York: Norman W. Henley Publishing Co. See Review.

WAR DEPARTMENT ANNUAL REPORTS, Vols. 1, 2 and 3. Vol. 1 contains annual reports of the Secretary of War, Chief of Staff, Adjutant General, Inspector General, Judge Advocate General, Quartermaster General, Surgeon General, Chief of Ordnance, Chief Signal Officer, Chief of the Militia Bureau, Chief of Coast Artillery, Chief of Construction Division, Director of Military Aeronautics, Director of Tank Corps, Director of Chemical War Service, Director of Aircraft Production, Superintendent of Military Academy, Chickamauga and Chattanooga Park Commission, Gettysburg Park Commission, Shiloh Park Commission and Vicksburg Park Commission; Vol. 2 contains the report of the Chief of Engineers (without appendices); Vol. 3 contains the reports of the Chief of the Bureau of Insular Affairs, 1918; the Governor of Porto Rico, 1918, and the Philippine Commission, 1917. Washington: Government Printing Office.

Latest U. S. Patents

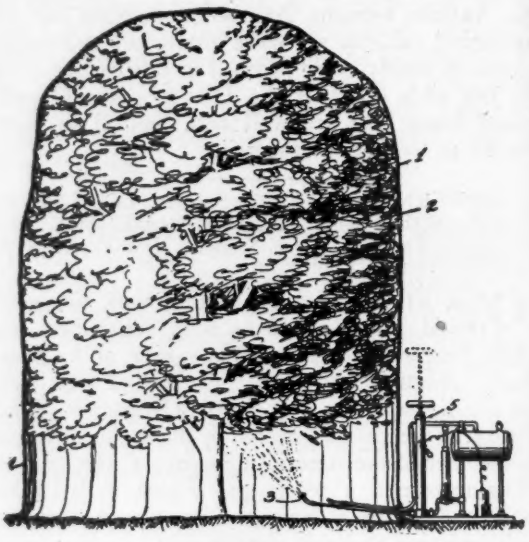
Full specifications and drawings of any patent may be obtained by sending five cents (not stamps) to the Commissioner of Patents, Washington, D. C.

MAY 27.

1,304,589. HAIR-DRIER. George W. Moore, Chicago, Ill.

1,304,671. AIR-PROPELLER. Ernest D. Fieux, New York, N. Y., and Harry S. Wheller, Rahway, N. J.

1,304,747. METHOD OF FUMIGATING. William G. Dingle, Los Angeles, Calif.



PATENT NO. 1,304,747.

1,304,915. PNEUMATIC INSOLE. Burton A. Spinney, Des Moines, Iowa.

1,304,922. MOLDING APPARATUS. Henry Tscherning, Freeport, Ill.

1,304,973. FUEL-FEEDING DEVICE. Charles S. Heffelfinger, Lebanon, Pa.

1,305,040. PNEUMATIC PUMP. Marion C. Walls, Franklin township, Hendricks county, Ind.

1,305,065. SHOCK-ABSORBER. Samuel Goff Conkling, Brooklyn, N. Y.

1,305,086. SANDING DEVICE. Alva A. Fryer, Kansas City, Mo.

JUNE 3.

1,305,242. PNEUMATIC CLEANER. George W. Allen, Boston, Mass.

1,305,260-1-6. COMPRESSED-AIR VALVE AND GAGE. Lucien T. Earnheart, Indianapolis, Ind.

1,305,349. PERCUSSION ROCK-DRILL. James Fletcher, Newnes, New South Wales, Australia.

1,305,403. PNEUMATIC-DESPATCH-TUBE APPARATUS. Emmett B. Perrine, Minneapolis, Minn.

1,305,574. AIR-BLAST PLASTERING-MACHINE. Gilbert E. White, Kewanee, Ill.

1,305,599. PROCESS FOR DRYING VARIOUS SUBSTANCES. Auguste A. Goubert, Englewood, N. J.

1,305,726. FLUID-PRESSURE APPARATUS FOR BURNING POWDERED FUEL. Patrick A. Leonard, Michael F. Maloney, and Ernest Fandrich, Schenectady, N. Y.

1,305,733. BRUSH. Robert P. Miller and Charles J. Bremer, St. Louis, Mo.

1,305,758. AIR-PUMP. Robert Warnock, Bloomfield, N. J.

1. In an air pump, the combination of a cylinder, piston, connecting road crank and a crank case in which said crank operates, said crank case being closed at the bottom to provide a lubricant reservoir, the exhaust from said cylinder taking place into said crank case.

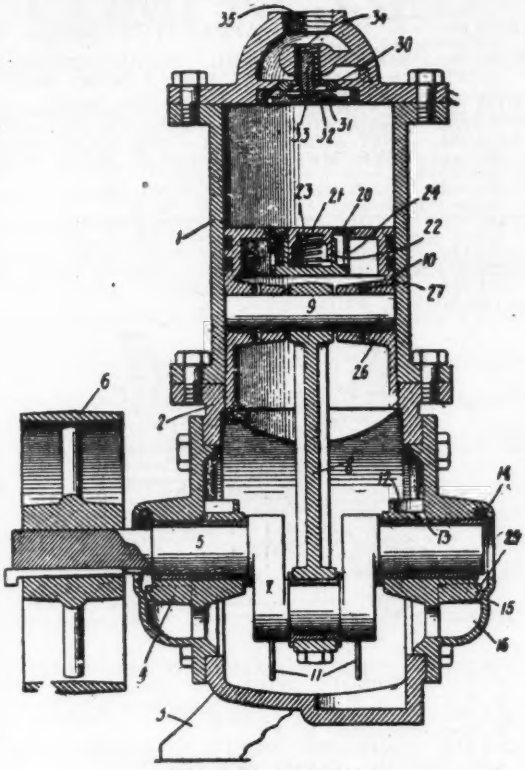
1,305,769. AIR-CIRCULATING DEVICE. Nicholas J. Cavagnaro, Union Course, N. Y.

1,305,789. WINDMILL. Clarence E. Flinchbaugh, Lima, Ohio.

1,305,912. AUTOMATIC SPRINKLER SYSTEM. Albert J. Loepsinger, Edgewood, R. I.

1,305,926. AIR-MOISTENER AND DUST-COLLECTOR. John S. Nelson, Sioux Falls, S. D.

1,305,943-4-5. HUMIDIFIER. Raymond D. Smith, Arlington, Mass.



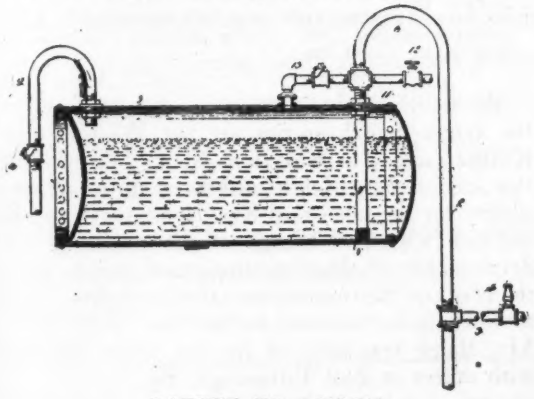
PATENT NO. 1,305,758.

JUNE 24.

1,307,348. AUTOMATIC DOOR OPENER AND CLOSER. Peter L. De Marce, Minneapolis, Minn.

1,307,350. PNEUMATIC VALVE-ACTION. Stanley L. Fisher, Saybrook, Conn.

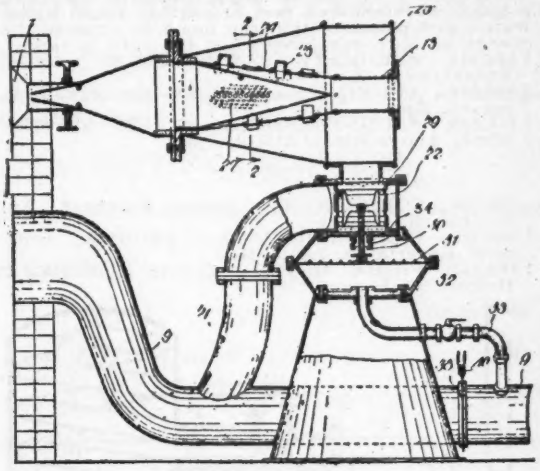
1,307,365. DEVICE FOR AERATING POWDERED FUEL. Alonzo G. Kinyon, Chicago, Ill.



PATENT NO. 1,305,912.

1,307,375. COMBUSTION OF POWDERED FUEL. Harry B. Pruden, Chicago, Ill.

A method of preparing powdered fuel for combustion which consists in maintaining a mass of powdered fuel in an inclosed space causing jets of air to impinge upon the fuel across an air space adjacent the fuel thus creating and maintaining a body of fuel-laden air in contact with said mass of powdered fuel, and agitating the fuel-laden air continuously to prevent precipitation of the fuel, and continuously drawing a supply of the mixture therefrom and feeding it to the place of combustion.



PATENT NO. 1,307,875.

1,307,459. MULTIPLE-BELLOWS PUMP. Lyman R. Roberts, Rutherford, N. J.

1,307,656. AIR-COOLING MACHINE. Santiago Camberos and David S. Camberos, Tuscon, Ariz.

1,307,875. METHOD OF EFFECTING HUMIDIFICATION. Lee H. Parker, Boston, Mass.

1,307,929. MILKING-MACHINE. Richard Northey Saunders, Auckland, New Zealand.

1,308,016. GAS-OPERATED GUN. William R. Clark, Seattle, Wash.

JUNE 10.

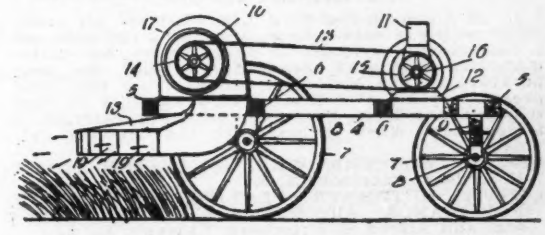
1,306,024. PNEUMATIC SEPARATOR. Frank H. Quade, Jr., Fresno, Calif.

1,306,075. MOLDING-MACHINE. Edgar H. Mumford, deceased, Plainfield, N. J., by Rose S. Mumford, executrix, Plainfield, N. J.

1,306,106. DRILL-STEEL-PINNING DEVICE. Jesse Ditson, Littleton, Colo.

1,306,159. PNEUMATIC MOTOR. Gustav W. Wallin, Chicago, Ill.

1,306,209. METHOD FOR ARTIFICIALLY COMPELLING THE FECUNDATION OF ALFALFA. William M. Williams, Harlem, Mont.



PATENT NO. 1,306,209.

The herein described method for effecting the fecundation of alfalfa, consisting in subjecting the stamen inclosing pods as soon as they have arrived at maturity to an artificially produced uniform current of air directed against the pods with sufficient force to drive the pods to bursting impact against members of the plant and to release and uniformly distribute the pollen.

1,306,300. PNEUMATIC IMPACT-TOOL. William Burlingham, Newport News, Va.

1,306,301. FLUID-MOTOR. John William Chadwick, Kansas City, Mo.

1,306,372. SUBMARINE MINE. Charles E. Egan and Elva F. Jackson, Charleston, W. Va.

1. A submarine mine comprising a float filled with compressed air, an attached bomb adapted to sink when released, a detent controlling the re-

lease upon reduction of air-pressure in the float, a slack cord rendered taut at a given depth under water, and means within the bomb to explode the charge of high explosive when the cord is taut.

1,306,395. PNEUMATIC SAW. John M. Abrams, Brooklyn, N. Y.

1,306,526. AIR-BRAKE. Frank S. Cravens, Lexington, Ky.

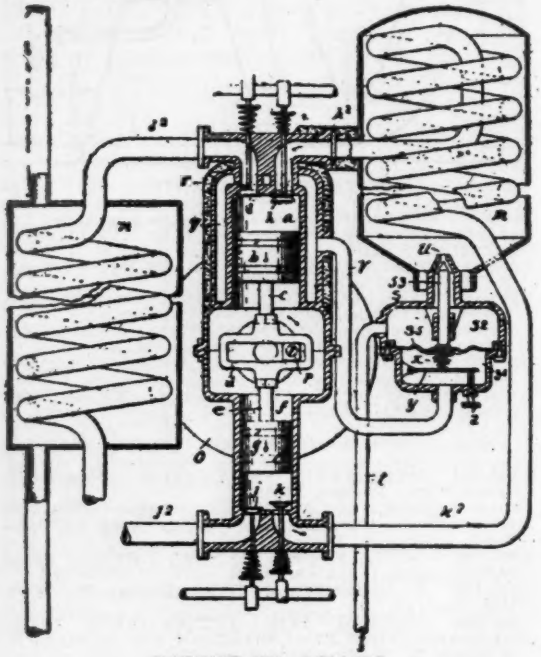
1,306,665. FLUID-PRESSURE BRAKE SYSTEM. James Amers Hicks, Atlanta, Ga.

JUNE 17.

1,306,680. COMPRESSOR. Georg Bernhard Ax, Stockholm, Sweden.

1,306,775. PNEUMATIC METAL-CATCHER. Alonzo J. Roberts, St. Louis, Mo.

1,306,865. PRIME MOVER. Elliott J. Stoddard, Detroit, Mich.



PATENT NO. 1,306,865.

1. In a caloric engine, a closed system, air under compression in said system, a working cylinder and a compression cylinder in said system, and automatically regulated means for raising the temperature of the air as it passes from the compression cylinder to the working cylinder so that it shall not have risen beyond a predetermined temperature when it passes to the working cylinder.

1,307,030. ELECTRIC WELDING SYSTEM. David H. Wilson, Paterson, N. J.

1,307,052. AUTOMATIC PLAYING ATTACHMENT FOR PIANOS. Alfred Johnson, Arthur C. Swanson, and Alfred H. Utterberg, Chicago, Ill.

1,307,061. COMPRESSOR FOR REFRIGERATING APPARATUS. Edwin O. Olsen, Milwaukee, Wis.

1,307,111. TURBINE-BLOWER. Axel W. Carlson, Worcester, Mass.

1,307,173. METHOD OF AND MEANS FOR INFLATING AND INTRODUCING SEALING LIQUID INTO PNEUMATIC TIRES. Daniel L. Anthony, El Paso, Tex.

1. The method of inflating, and introducing sealing liquid into, a pneumatic tire, which consists in puncturing the pneumatic tire, and then, through the opening thus made, introducing in a single operation into the pneumatic tire, first, a tire sealing liquid, and, then, compressed air in quantity sufficient to fully inflate the tire.

1,307,195. PNEUMATIC FOUNTAIN-PEN. Joseph F. Gardner, Kansas City, Mo.

1,307,280. PROCESS FOR THE RECOVERY OF GASOLENE AND OTHER HYDROCARBONS. William E. Walker, Arkansas City, Kans.

JULY 1.

1,308,051-2-3. MILKING APPARATUS. Reuben B. Disbrow, St. Paul, Minn.

1,308,095. APPARATUS FOR MANUFACTURING ARTICLES OF GLASS. William J. Miller, Swissvale borough, Pa.

1,308,137. APPARATUS FOR USING POWDERED FUEL. Charles D. Young, Altoona, Pa.

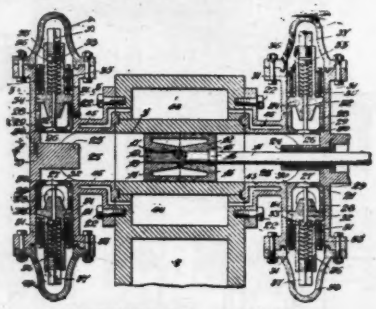
1,308,159. UNIT-ACTION FOR PNEUMATIC MUSICAL INSTRUMENTS. George P. Brand, New York, N. Y.

1,308,168. PONTOON FOR RAISING SHIPS. Andrew Courvoisier, Huguenot Park, N. Y.

1,308,170. FLUID POWER TRANSMISSION. Dimitri Sensaud de Lavaud, New York, N. Y.

1,308,191. PNEUMATIC-DESPATCH-TUBE SYSTEM. Emmett B. Perrine, Minneapolis, Minn.

1,308,288. AMMONIA-COMPRESSOR. Joseph Harvey McCain, Philadelphia, Pa.



PATENT NO. 1,308,288.

1,308,368-9. COMBINED AIR AND PULVERIZED-FUEL CONTROL. William O. Renkin, Oradell, N. J.

1,308,387. COMPOUND AIR-PUMP. Charles G. Bauer, Brooklyn, N. Y.

1,308,436. COMBINED FLUID-PRESSURE PUMP AND MOTOR. Robert Maw and William B. McLean, Montreal, Quebec, Canada.

1,308,464. APPARATUS FOR PNEUMATIC CONVEYANCE OF MATERIALS. Jens Westly, Lysaker, near Christiania, Norway.

1,308,472. ATMOSPHERIC GAS-BURNER. William Barratt, Coburg, Victoria, Australia.

1,308,557. CLIMB-INDICATOR FOR AIRCRAFTS. Benson R. Shaw, Dayton, Ohio.

1,308,569. APPARATUS FOR MEASURING GAS AND OTHER FLUIDS. Thomas B. Wylie, Pittsburgh, Pa.

1,308,603. APPARATUS FOR EXHAUSTING AND COMPRESSING AIR. David Morgan, Launceston, Tasmania, Australia.

W. G. Balph has been appointed manager of the safety switch section of the Westinghouse Krantz factory at Brooklyn, N. Y. As head of this section Mr. Balph will have entire responsibility for the sale of all Krantz products, and in addition will have charge of the extension and development of this very important line to meet the needs of the country for safety switches. Prior to working as salesman in the New York office, Mr. Balph was head of the fan motor division with offices at East Pittsburgh, Pa.

* * * *

Dr. Arthur A. Hammerschlag, director of Carnegie Institute of Technology, Pittsburgh, recently received the bronze medal awarded him by the Panama-Pacific International Exposition. He was a member of the international jury of awards at the exposition.

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MAP OF THE NEW EUROPE AS SETTLED BY THE VERSAILLES PEACE TREATY. SEE KEY TO SHADED AREAS AT RIGHT.